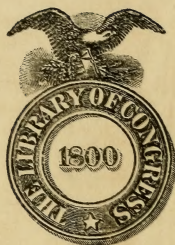




THE VEGETABLE GARDEN

By R. L. WATTS





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THE VEGETABLE GARDEN



The Squash Is Not as Highly Appreciated as It Should Be

THE VEGETABLE GARDEN

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CHAPTER I

GARDENS FOR EVERYBODY

THE census report for 1910 values the vegetables produced in the United States at \$417,000,000, while all other horticultural crops of that year are valued at \$273,000,000. Most land owners believe that fruit has made the better financial showing. Although this is an erroneous impression, it is the natural result of the fact that agricultural colleges, agricultural experiment stations, horticultural associations, and farm papers have given far more attention to fruit culture than to vegetable gardening. The fact is that if the census figures include the value of the enormous quantities of vegetables grown in home gardens in country and town, the amount would be greatly increased.

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As the manuscript of this little volume goes to press, greater activity than ever may be observed along every line of vegetable gardening. The agricultural colleges are offering courses of instruction in home vegetable gardening, market gardening, farm gardening or truck farming, vegetable forcing, and in the systematic study of the varieties and classes of vegetables. Agricultural experiment stations are undertaking investigations relative to the development of improved strains of well-known varieties; the control of troublesome insects and diseases; the proper application of commercial fertilizers and stable manures; the various soil types for the production of vegetables; and other cultural problems which are demanding attention.

The markets of the United States are unsurpassed in their demands for choice vegetables. Our cities are largely supplied by great, well-known trucking districts, but there will always be a place for the grower who desires to produce vegetables on a small scale with a view to meeting local demands. So many home tables are poorly supplied with fresh vegetables, that it would be both profitable and public-spirited for the small land owner to plant a spacious area and sell the surplus to neighbors or to stores in exchange for groceries. A home gar-

den of liberal proportions in town or country offers opportunities not to be disregarded. By skillful management it will reduce the cost of living, and provide not only an abundance of fresh vegetables during a large part of the year, but also a quantity to be stored and canned for use throughout the winter season.

People of all classes in our towns and cities have become interested in gardening. Many persons undertake the work as a means of diminishing household expenses. Fresh vegetables of high quality are not always obtainable, even though cash may be available for the prices demanded, and a garden in the back-yard helps to solve this household problem.

There is a vast difference in the quality of vegetables transported long distances, and kept in over-heated city stores for several hours, and those which are served direct from one's own garden. Vegetables grown by our own hands always seem more satisfying than those purchased in a store or market. Furthermore, we are able to recommend, from practical experimentation the health-giving qualities of a diet of fresh vegetables, and the increase of vigor which may be acquired from gardening by those engaged in sedentary occupations. Work in the garden, even for fifteen minutes a day, with

the hoe, trowel, or other tools, often yields tremendous results in the way of genuine pleasure and improved health. It affords mental relaxation and at times absolute forgetfulness of daily cares and annoyances.

In recent years, gardening among the laboring classes of the large towns and cities has been recommended as a means not only of reducing the cost of living but of providing pleasant and profitable employment for the wage-earner and his family, when other duties do not demand their attention. These ideas are excellent and worthy of consideration wherever conditions are favorable for successful gardening. Millions of families in towns, where there are mining and manufacturing industries, might well devote a part of their yards to the growing of vegetables.

By following the most intensive plans, such as are explained in the various chapters of this little book, a surprisingly large quantity of vegetables may be grown on a plot of ground of a few hundred square feet. The results of a well-managed laboring man's garden will show in smaller monthly grocery bills.

The "vacant lot" gardening movement is becoming popular throughout the country. In every town and in the suburbs of every city,

there are many lots that might be made to produce large supplies of choice vegetables. The lots would serve a much more useful purpose as gardens than as dumping grounds for ashes, tin cans, and other rubbish. A few flowers interspersed with the vegetables will make the plots objects of real beauty. The landscape features of many a village and suburb would be improved by the use of neglected lots for vegetable gardening. Furthermore, such gardens invest a town with an appearance of thrift. If owners of vacant lots do not desire to cultivate them, they should rent them at prices sufficiently low to attract gardeners.

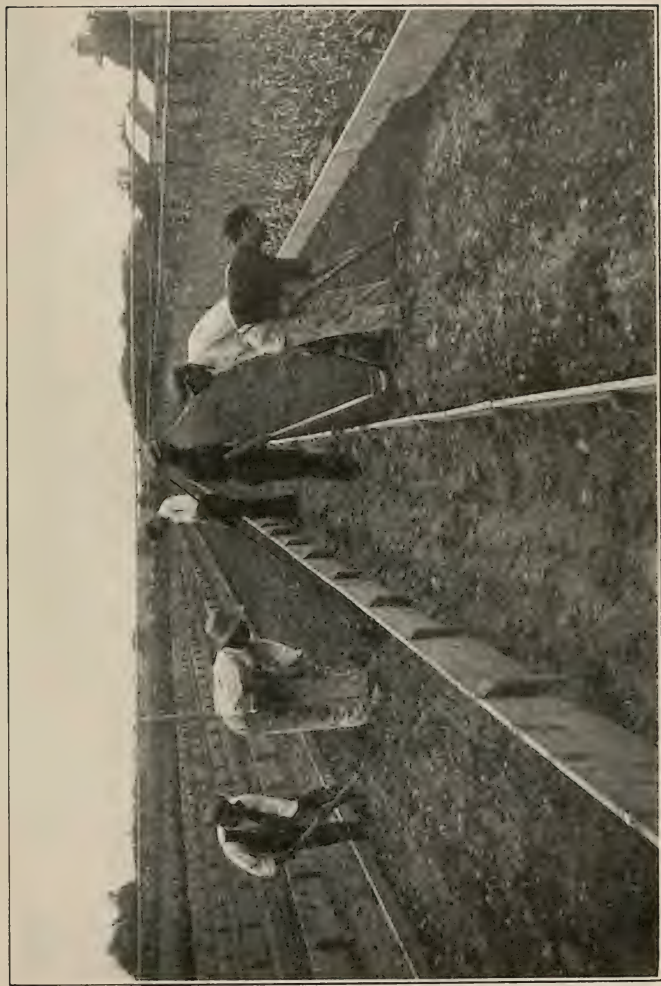
Children take to gardening "like ducks to water." They like to dig, rake, shovel, and hoe. They like to sow seeds and watch the plants grow. Their little hearts crave such employment. Is it just to rear children without giving them opportunity to satisfy such in-born desires? People who must live in crowded districts can procure window boxes. Those who own or rent even a few square feet of old mother earth can give a part of the space to the children for the growing of vegetables and flowers. The children, too, should have a real interest in the larger gardens of back-yards and vacant lots.

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Organizations in some of the larger cities have exerted a splendid influence in this direction. They have helped children and adults to find suitable land, and they have given the necessary instructions for the making of good gardens. Whatever may be the social or moral standing of the families interested, it is a real uplift movement in every sense.

Too much can not be said in favor of school-garden work in connection with public schools. It deserves all the encouragement that the directing boards are able to give. As an educational proposition it is well worth while; it teaches thrift and industry; it gives the children an opportunity to observe the results of their own labor; and it brings them close to nature. Thus it helps to develop the best type of manhood and womanhood.

Vegetable forcing is a branch of vegetable gardening. It relates to the growing of vegetables under artificial conditions. Hotbeds, cold-frames, and greenhouses are used for forcing vegetables. The whole vegetable-forcing industry has made wonderful progress in the United States during the past two decades. It is the most certain type of vegetable gardening because it provides conditions that may be controlled. With a properly built and equipped



In well managed market gardens, the ground inside of the frames, as well as in the fields, is utilized during the entire summer.

greenhouse, there should be practically no failures.

Frost and cold are kept away from the crop by a heating plant of ample capacity. Destructive insects and diseases in the soil are destroyed by cooking the soil with steam before the crop is started. Insects infesting the parts of the plant above ground are controlled by spraying or fumigation. Water is supplied by a real rain machine so that there need be no fear of drought.

Wherever good markets are available, vegetable forcing is an attractive business proposition. Thousands of people should have hot-beds and cold-frames in which to start early plants and to grow vegetables for the home earlier in the spring and later in the fall than it is possible to grow them out-of-doors.

CHAPTER II

WHERE TO GROW VEGETABLES

WHEN vegetables are to be produced on a large commercial scale the utmost care should be exercised in the selection of a location. The great centers of population afford a market for unlimited quantities of vegetables and hundreds of towns and cities in every state of the union are seeking a constant supply of fresh products from the garden. The fact is that practically every community offers opportunities of some kind for the growing of vegetables for commercial purposes, although the demand may not be large.

Sometimes one or two special crops can be disposed of to advantage, while the inducements for the production and marketing of a general assortment of vegetables may not be encouraging. Before growing a surplus of any vegetable for commercial purposes, local markets or shipping facilities should be carefully studied. The all important thing is to determine the best opportunities from a business standpoint before

extending operations beyond the limits of the garden actually needed to supply the home table.

Next to markets, suitable soil is the most important factor in the selection of a location for the growing of vegetables. Deep, sandy loams are ideal for gardening purposes. Such soils possess good drainage, are easy to cultivate, retain fertility fairly well, and are adapted to the various classes of vegetables. The value of sand in soils to be used for gardening can not be overestimated. The good drainage insured by sand, especially if there is a porous subsoil, results in a higher soil temperature in the spring and, therefore, such soils are especially desirable for the growing of early vegetables and those classes of crops — as the eggplant — that require a constantly warm soil. The sandy soils are easy to spade, plow, harrow, and cultivate. They are not subject to hard baking and may be cultivated soon after rainfall. There is always more or less tramping of the ground in harvesting garden crops, but this is not as injurious to sandy soils as to heavy soils. The root crops are smoother, better formed, and have fewer small fibrous lateral roots when they are grown in sandy soil. The advantage of some sand in the vegetable garden is so great

that it is often hauled short distances and mixed with the heavier garden soils. This is seldom practical on a large scale but there is no reason why a few loads of sand should not be added to the part of every home garden which is to be used for the growing of head lettuce and the root crops.

The absence of sand or the impracticability of obtaining it for the garden, however, should not form any especial handicap to one who is anxious to grow choice vegetables. The stiffest clay soils may be made to produce most excellent garden crops. They are more retentive of plant food than light soils, and that is an advantage which should not be overlooked. Their physical properties may be greatly modified by the use of stable manure or perhaps green manurial crops. An increased supply of organic matter makes the soil more friable and porous and easier to cultivate. If stable manures are applied to heavy soils annually over a long term of years the soils become materially modified in structure and much darker in color. Heavy soils are especially suitable for cabbage, late cauliflower, late tomatoes, sweet corn, cucumbers, and squashes, and if such soils are well supplied with organic matter all of the vegetables may be grown successfully.

Muck soils are especially well adapted to onions, celery, and head lettuce. Tremendous areas of these crops are now grown in the muck soils of the United States. Muck soil is an exceedingly valuable addition to clay soils, as it makes them lighter and more porous. It is also excellent for the starting of early vegetable plants in the greenhouse or hotbed.

Stony areas may quickly be improved for gardening purposes. It is a simple matter to pick up the larger stones and the smaller ones may be removed by the use of rakes, shovels, and forks.

Whatever the soil texture — whether sandy, clayey, or stony — the drainage must be perfect. It is sometimes necessary to use tile drains to dispose of the surplus soil moisture.

Vegetable gardening is one of the most intensive branches of farming, and this is especially true of market gardening, where the plants are grown close together and manures and fertilizers are often applied with the greatest liberality. With any intensive system of gardening, the expenses of production are necessarily high, and every possible effort should be made to avoid crop failures.

In recent years a very high value has been placed on soil moisture as a factor in crop

growth. Formerly, more emphasis was given to manures and fertilizers, but now we realize that, though every other soil condition is perfect, if there is a shortage of soil moisture at any time during the period of growth, a full crop is impossible. So essential to success is a constant and liberal supply of soil moisture, that many gardeners are installing overhead systems of irrigation. Therefore, in the selection of a location for garden work, it is well to consider the question of whether a bountiful supply of water is easily available for irrigation. Successful crop production and satisfactory profits are much more likely to be certain with an irrigation plant than without it.

The character of the climate is a tremendous factor in the growing of vegetables, and climatic advantages and disadvantages should be most carefully considered in deciding on the crops to be grown. High temperatures are essential to some crops and disastrous to others. High humidity is required by some vegetables and is harmful to others. Some crops must have a long season, while others, such as the radish, may be matured in less than a month. A host of gardeners are attempting to grow and to make garden crops pay under climatic conditions

which are most unfavorable to the vegetables selected. While this is true, it should also be remembered that market conditions are often so favorable that one is justified in growing vegetables where soil and climatic conditions are most unfavorable. For example, I know a gardener who gets fancy prices for eggplants grown in a cool mountain region which provides very poor conditions for this vegetable.

The ability to produce a garden crop may depend largely upon the aspect of the land. This is especially true in the growing of early crops. Gardens which slope to the south or southeast are the warmest, and this is a most decided advantage in the production of early crops. Again, the value of windbreaks or protection from cold north and west winds should be considered. Hills, woodlots, orchards, and buildings sometimes afford the necessary protection. When these do not exist it is a simple matter to establish windbreaks. One of the most effective and attractive windbreaks of my knowledge is a double row of mixed evergreens, mainly Norway Spruce, interspersed with deciduous trees. The white and purple flowers of the lilac, appearing in great profusion at intervals in the windbreak, with dark evergreen for a back-

ground, excite constant admiration. Wind-breaks should be more generally used by American gardeners.

Transportation facilities should be fully considered in the selection of a location, or in deciding the extent to which vegetables should be grown on any farm. A good wagon road is especially important to insure speedy and satisfactory delivery. For a large business enterprise, a motor truck may be found of advantage. It has been clearly demonstrated that the cost of hauling vegetables, especially long distances, is less by motor power than by horse power. In other words, gasoline furnishes cheaper motive power than oats. With a smooth, hard, level road, vegetables may be transported twenty-five miles or more by auto trucks, although the shorter hauls are, of course, much less expensive.

The cost and availability of stable manures are also important factors. With the increased use of automobiles and delivery trucks in the cities, the supply of manure will become less and less. This is a strong argument for the farmer who keeps live stock to engage in gardening, perhaps as a side line to his regular business.

Experiments at The Pennsylvania State College show that the productive power of a lime-

stone soil may be economically maintained, perhaps for an indefinite period, by the judicious use of lime and fertilizers applied in a four-year rotation of wheat, clover, corn, and oats. In other words, it would be possible for one to produce these crops, feed them to live stock, and use all of the manure for the growing of vegetables.

CHAPTER III

HOTBEDS, COLD-FRAMES, AND GREEN- HOUSES

SUCCESS in vegetable gardening depends very largely on the earliness of the products. Prices usually decline rapidly after the first home grown vegetables are placed on the market, and a difference of only a few days in reaching the market with any product may make an appreciable difference in the profits of the season.

Many vegetables, such as cabbage, lettuce, tomatoes, eggplants, and peppers, must be started under glass in order to reach an early market, and this necessitates the construction of hotbeds, cold-frames, or greenhouses. Hotbeds are generally employed by all classes of vegetable growers unless greenhouses are available to take their place. Hotbeds are also employed for the forcing of vegetables to maturity. Lettuce, radishes, and beets are the most common crops forced in them, although many other

vegetables are sometimes grown to maturity in hotbeds.

Since the hotbed is generally started late in the winter while there is severe weather, it is important to select a protected spot for it. A farm building north of the frame may give the necessary shelter. If this does not exist, and the location is swept by hard winds, a solid board fence may be constructed and this will also be found convenient for the drying of straw mats. A southern or southeastern exposure is always best for hotbeds, cold-frames, and greenhouses.

The depth of the hotbed and the amount of manure which should be used depend on several factors. In very severe climates and for mid-winter service, the depth must be greater than for mild climates and spring use. In some sections it is customary to have at least thirty inches of manure in the pits, while in others half that quantity will suffice. Ordinarily, twenty-four inches of manure are ample for the starting of early spring plants, so that the pit need not be more than two feet deep. The digging of the pit should be attended to in the fall before there is hard freezing weather. Leaves, straw, or coarse manure should be placed in the bottom of the pit to prevent freezing.

The frame for the hotbed may be made of wood, brick, or concrete. The latter material is most desirable, although wooden frames are in more general use. The frames should be made to accommodate the size of sash to be employed. Standard sash are six feet long, therefore the outside width of the frame at the top should be six feet. Most sash are three feet wide and the frames, therefore, may be 9, 12, 15 feet, or more, in length, according to the number of plants to be started.

Any kind of sound lumber may be used for the frame. Cypress is the most durable, although considerably more expensive than hemlock. Lumber that is an inch thick will serve the purpose, although two-inch planks make a stronger and more desirable frame. Ordinarily, the boards or planks are nailed to 2 x 4 posts placed at intervals of several feet. Some gardeners prefer to use any kind of old boards for the sides of the frame below ground and a movable frame for the top. Whatever the type or form of construction, the frame should be six inches higher on the north than on the south side.

While frames are sometimes made without crossbars, they are a great advantage for the support of the sash and they also give strength

and rigidity to the frame; 2 x 3 inch pieces are ample in size. They are placed 3 feet apart when 3 x 6 foot sash are used, and if desired half inch strips may be nailed in the middle on top of them. This will prevent binding when the sash are handled.

Fresh horse manure has been found to be the best heating material for hotbeds. To give the best results, it should contain about two parts of solid excrement to one part of bedding, such as straw or leaves.

The manure for the pit should be prepared under cover. A warm stable is suitable in a severe climate. The manure is tramped fairly compactly in piles four or five feet wide and four feet deep. If the manure is very dry, some warm water may be necessary to insure rapid and satisfactory heating. The object of placing the manure in the piles is to start fermentation before it is placed in the pits. Failure is often due to this neglect. Fermentation will be well under way in a few days, after which the manure should be restacked by placing the outer parts of the original pile in the interior of the new pile. About two days later the entire mass should be hot and then the pit should be filled.

If it is desired to begin sowing seed the tenth of February, preparation of the manure should

be started about a week in advance. When filling the pit, it is best to add layers of five or six inches of manure, tramping each layer in order to prevent too much settling of the entire mass. It is especially important to pack the manure in the corners and along the sides of the frames. Hot manure is also banked to the tops of the frames on the outside. After the manure in the frame has settled for a day or two, soil is placed on top of it, the amount depending on the use of the hotbed. An inch or two of soil will be an advantage in absorbing the steam and gases of the manure. If seed is to be sown directly in the soil, without using flats, three or four inches of soil should be used. If the hotbed is to be employed for forcing purposes, as, for instance, the growing of radishes and lettuce, five or six inches of soil will be necessary for the best results.

Instead of using manure-heated frames, many gardeners use either steam or hot water by running a coil or two of inch to one and one-half inch pipe around the inside of the frame and immediately under the crossbars. It is sometimes possible to make connections with the boiler of the furnace which heats the residence of the grower. With steam or hot-water heating, the frames may be used all winter, al-

though greenhouses are preferable when either method of heating is possible.

Most hotbed sash are made of cypress. Cedar is also excellent. These woods are very durable and with proper care will last for 25 years or longer. While the heavier sash are stronger and somewhat more durable, sash made of one and three-eighths inch stuff are highly satisfactory and much easier to handle. A bracing rod across the middle is important, and the mortised joints of the frames should be leaded to insure durability. It pays to paint the sash every other year and to keep them under cover when not in use.

Cold-frames are of great value in starting early vegetable plants. The usual plan is to sow seed in the hotbed and transplant the small seedlings to the cold-frame. The cold-frame used by vegetable gardeners differs from the hotbed in being placed on top of the ground; excavation is not necessary and no manure is used inside of the frame but it is valuable when banked around the outside. Like the hotbed, it should have a slope of about six inches to the south or southeast. A protected location is exceedingly important.

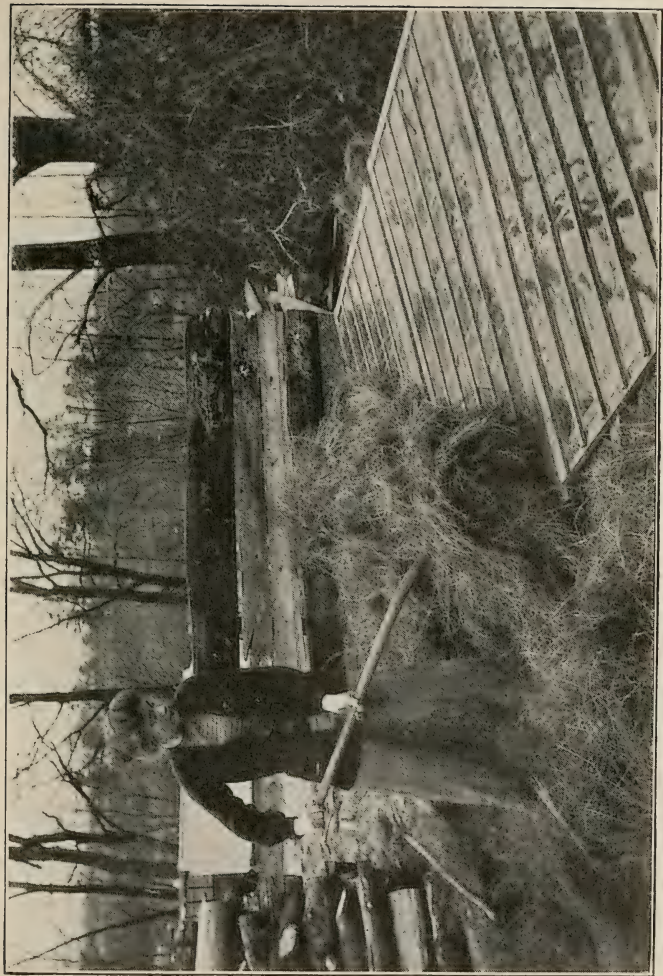
The frames may be of any desired length; it is not uncommon to see them several hun-

dred feet long. When two or more frames are used, there should be ample space between them, so that snow may be disposed of and the sash handled easily. Unless economy of space is absolutely essential, there should be 10 or 12 feet between the frames.

The frames are simple in construction. In large commercial establishments, after the ground is graded, stakes are usually driven at convenient intervals, and to these the sides and ends of the frames are nailed. Ten-inch boards or plank will do for the lower side and twelve-inch for the upper. Sometimes a greater depth of frame is obtained at the upper side by using two boards, each about eight inches wide; then, with a ten-inch board on the lower side, a six-inch slope will be obtained and the soil of the cold-frame will be perfectly level.

The cold-frame may be used for a great variety of purposes and the soil should be made as good as possible. A large supply of water will be needed and it should be easily accessible. The best plan is to have the water piped between the frames with spigots conveniently arranged for the attachment of hose.

Hundreds of commercial growers have found it profitable to operate greenhouses. The greenhouse is more satisfactory than the hot-



Hay or straw may be used to advantage in covering cold frames to protect plants during cold weather. With such a covering, the temperature outdoors may drop to zero and the plants inside the frames will receive no injury.

bed for the growing of early plants, and it is also preferable for forcing purposes. There is no reason why thousands of garden makers should not have small greenhouses. They insure summer-time the year around on a part of the place and may be made a source of great pleasure as well as profit.

The best construction is none too good. Cypress should be employed for all wood parts. Iron should be used as much as possible for supports and purlins. Concrete and iron posts may enter into the wall construction. Glass of high quality is the best and cheapest in the long run. Sash bars should never be closer together than sixteen inches. Hot water is the best form of heating for small houses because it requires the least attention.

While raised benches are convenient, especially in starting early plants, they are not essential. Many of the best and largest houses do not contain benches or even wood or concrete sides to solid beds. In these large houses there are practically no obstructions to tillage operations. Large doors are often provided and horses and horse implements are used in preparing the land for the various crops. This is farming under glass on the most intensive scale. Greenhouses on either large or small

places help to provide work for employees the year around. Many sections of the North offer splendid inducements for vegetable forcing.

CHAPTER IV

STARTING EARLY VEGETABLE PLANTS

IT is presumed that a hotbed has been made in accordance, perhaps, with the instructions given in Chapter III, or that a greenhouse is available for starting the seedlings. A cold-frame is also desirable for the hardier plants, such as lettuce and cabbage.

Many plant growers prefer to sow in shallow boxes, often called flats, instead of directly in the soil of the greenhouse or hotbed. They are very convenient and give fully as good results as, and sometimes better than, bed sowings. Flats need not be more than two inches deep, although less attention to watering will be required if they are three or four inches deep. To offset this advantage there are the disadvantages of a larger supply of soil to fill the boxes and increased weight, which is especially objectionable when the boxes are taken to the field. Boxes 16 x 20 or 22 inches in size may be easily handled, when filled, by boys of fifteen

years, provided the boxes are not more than two inches deep.

Flats are often made from store goods boxes and this may be the cheapest way to obtain them. Boxes in which soap and canned goods have been shipped are convenient for this purpose. They may be ripped into two-inch sections and extra bottoms supplied from larger boxes. Whatever plan is adopted, it is important that the flats be made to fit the frames or greenhouse benches with the least amount of lost space. If stored under cover when not in use, flats should last four or five years or even longer.

Rye straw mats are exceedingly important for the protection of plants, both in the hotbed and cold-frame. They may be made at home, but a better and neater machine-made, rye-straw mat is now available on the market. It will be necessary to have a good rubber hose of sufficient length to reach all the sash, a nozzle with rectangular face which is made especially for the watering plants, an ordinary watering can holding two gallons, transplanting boards, dibbers, and straight-edges.

The transplanting boards are of sufficient size to cover the largest flats. They are best made by nailing two boards, each eight or ten

inches wide, on two half-inch cleats. The cleats must be at the ends of the boards with sufficient space between the former to cover the largest flats. A three-quarter inch auger is used to bore holes in the board in check rows. For cabbage plants there should be a board with the holes one and one-half inches apart each way, while for tomatoes the holes should be two inches apart.

The wooden dibbers for punching the holes are generally made with shoulders so that the depth of the holes may be regulated to suit the size of the seedlings to be planted. Paper pots which may be purchased or made at home are often a great advantage in growing very strong plants. Some growers prefer them to the heavier and more expensive earthen pots, which must be collected in the field, returned to the potting house, and stored there for use another year.

The soil to be used for starting vegetables should be selected from a field which does not contain germs of any of the diseases like club-root of cabbage, blight of tomatoes, or other hindrances to crop-growing. The only certain means of avoiding these troubles is to take soil from land which has not, for many years at least, grown any of the crops which are to be

started in the soil selected. The soil should be as free as possible from stones, sticks, and other debris which would interfere with seed sowing and transplanting. It should be light in texture, if possible, and abounding in decaying vegetable matter.

Because of the impossibility of obtaining entirely satisfactory soil on most farms for the starting of plants, it is customary to prepare composts. Two or three parts of any good soil, one part of rotten manure, and one part of sand make a splendid medium for the growing of young plants. If desired, the soil and manure may be composted out-of-doors for a period of four months or longer and the sand added just before sowing or planting.

Whatever plan is used the grower should bear in mind that the soil should take water freely and not bake hard after watering. Sand and manure will obviate these difficulties and they may be used in such proportions as are necessary. Two quarts of slaked lime added to each bushel of heavy clay soil, besides sand and manure, will make it more porous and friable. The soil should be placed under cover in the fall, where it will not be frozen when wanted for use during the winter or early spring. Hard freezing may be prevented by

mulching the soil with several inches of coarse manure.

If the soil is very coarse, it will be an advantage to screen it before filling the flats. The soil will also work better if it contains the proper amount of moisture. This may be easily regulated by sprinkling with the hose or watering pot, while a man turns the pile over with a shovel.

When the flats are being filled, it is important to firm the soil well along the sides and in the corners of the boxes. A very rapid and convenient way of filling plant boxes is to place a half dozen of them around the pile of soil and shovel a surplus of soil into each box. A straight-edge is used to level the soil, and after the latter is pressed with the hands the same implement is employed to level the surface. The box is now ready for sowing.

If the soil is heavy, a special advantage will be gained by sowing in rows instead of broadcast. If the broadcast method is used and the soil is subject to baking, the seedlings in struggling to reach the light will lift up cakes of soil as large as the hand, and the result will be many crooked and crippled plants. When the seedlings are sown in rows, the young plants assist each other in their struggle and nearly always

come up perfectly straight and erect. This is a great advantage in the process of pulling and transplanting seedlings.

In planting such vegetables as cabbage, lettuce, and tomatoes, about one dozen seeds should be sown to each inch of furrow. No harm will result if as many as fifteen seeds should be dropped occasionally in an inch of furrow. The furrows are easily and quickly made by the use of a straight-edge made from any thin piece of lumber, such as a plastering lath, which should be about one-half inch less in length than the width of the box to be sown. The straight-edge is pressed into the soil to the desired depth, which should be about one-fourth of an inch for cabbage, lettuce, tomatoes, cauliflower, peppers, and eggplant.

The most rapid way to sow is with an envelope. Take an ordinary envelope and seal it. With a sharp knife or a pair of scissors cut it in two in the middle. In sowing, simply scoop up a quantity of seed with the envelope and with a rapid movement of the hand back and forth along the row distribute the seeds as evenly as possible in the furrow. The latter may then be closed by drawing the thumb and index finger along the sides of the row; or if preferred the furrows may be closed by the use of two small,

flat sticks, such as pot labels, pressed against the rows. Immediately after covering the seeds, the ground should be made firm by the use of a block of wood and then thoroughly watered.

The flats are then placed on an inch or two of soil in the hotbed, which has been filled with manure four or five days before, or on the greenhouse bench. Unless the weather is bright and sunny and very warm, no more water may be needed until the plants are up. The question of watering, however, is a matter of judgment, and experience is required to avoid mistakes. The ground should be kept fairly moist until germination is complete and then the appearance of the soil will be the best index as to whether water is needed or not. If the plants make a fairly rapid growth and possess a dark green color, the watering has been satisfactory. If, on the other hand, the plants are spindling and light green in color, the probabilities are that too much water has been applied. It is important to see that the watering is uniform, and especial care should be taken to keep the soil moist in the corners and along the sides of the flats.

Some fresh air should be admitted to the frames every day unless the weather is too

severe. Excessive moisture in the soil as well as in the air of the frames or greenhouse, together with high temperature, invariably results in poor plants. If the hotbed is started during severe weather, care must be exercised that cold draughts do not strike the plants. This can be accomplished by opening the sash on the side opposite the direction from which the wind is blowing.

In cold weather, protection of the plants is necessary in addition to the covering afforded by the sash. As previously indicated, rye-straw mats are most satisfactory for this purpose. They should be placed on the sash about four o'clock in the afternoon, or earlier if the weather is very cold, and removed in the morning as soon as the sun appears. The time of covering or removing the mats from the sash will depend, however, entirely on weather conditions. Effort should be made to maintain a night temperature of not less than 40 degrees for the hardier vegetables and 50 to 60 degrees for the more tender ones. A day temperature of 60 in cloudy weather is suitable for cabbage, while the tomato prefers a temperature 10 degrees higher. In sunny weather, the temperature will run much higher but with no detriment

to the plants, provided the frames or green-houses are properly ventilated.

In about three weeks the rough leaves of the seedlings will be well formed and transplanting should be started. If the plants have been given the proper attention, they will be about two inches high and strong and sturdy. Soil for the flats should be prepared as previously directed in this chapter. Before filling the flats with soil, about an inch of rotten manure is first placed in the bottom of them. This will help to nourish the plants, and will make it possible to remove them at the time of transplanting with the maximum quantity of soil and manure adhering to the roots.

It is exceedingly important that the boxes be so full over the entire surface that the transplanting board will press firmly against the soil at every point. Unless this condition exists the soil will crumble into the holes when the dibber is removed. The transplanting board is held in place by one hand while the other quickly punches the holes. It is then removed and a plant is dropped into each hole; the plants should always lean back or away from the dropper.

The work of dropping is most economically

done by children and a man can fasten or secure the plants for at least four or five dropers. The thumbs and fingers may be used for filling the holes or, if preferred, dibbers, which are half an inch in diameter and pointed at the tips, may be employed. It is essential that the soil particles come in direct contact with the rootlets of the plants and considerable pressure is necessary to accomplish this. Water if necessary after transplanting and place the flats in the cold-frames.

If cabbage seed, for example, has been sown on the tenth of February, the plants will be ready for the cold-frame by the first week of March. If there is hard freezing weather when the plants are shifted to the frames, some protection must be given, such as a burlap sack placed over the plants when carrying them from the transplanting room to the frames. The snow should be shoveled out and the frames covered with sash two weeks in advance of transplanting.

The general directions given for the care of plants in the hotbed will also serve for the cold-frame. It is necessary, however, as the plants increase in size, to ventilate with greater freedom. By the first of April the plants should be 4 or 5 inches high, or nearly large enough for

the field. Unless the weather conditions are very unfavorable, practically no protection will be needed by the plants during the daytime. The hardening process should then be started for cabbage and lettuce, so that the plants will stand hard freezing in the field.

More fresh air is admitted every day until the sash are left off entirely during the day and finally no protection is given at night. Water is also used sparingly during the hardening period. Properly hardened plants possess a bluish-green color, and plants of this character will stand a temperature of twelve degrees below freezing, unless there is very high wind in connection with the low temperature, which may break the tissues of the stems and cause the plants to fall over.

CHAPTER V

TILLAGE PROBLEMS

SUCCESS in vegetable gardening is largely dependent on the character of the tillage which the soil receives. The proper kind of tillage is even more important than the free use of fertilizers. Some growers would increase their profits if they applied less fertilizer and were more faithful in tillage operations. By this statement we do not mean to minimize the value of fertilizers, but we do wish to convey the idea that a host of garden makers place too much dependence on the plant foods applied and not enough on tillage. We must bear in mind that tillage modifies the physical properties of the soil; regulates soil moisture; changes soil temperatures; aerates the soil; provides more favorable conditions for the work of friendly bacteria; destroys weeds; prevents surface erosion; and covers and mixes with the soil humus-making materials, such as stable manures and green crops.

The effects of tillage are so different under various conditions that every gardener should give the whole subject the most careful consideration.

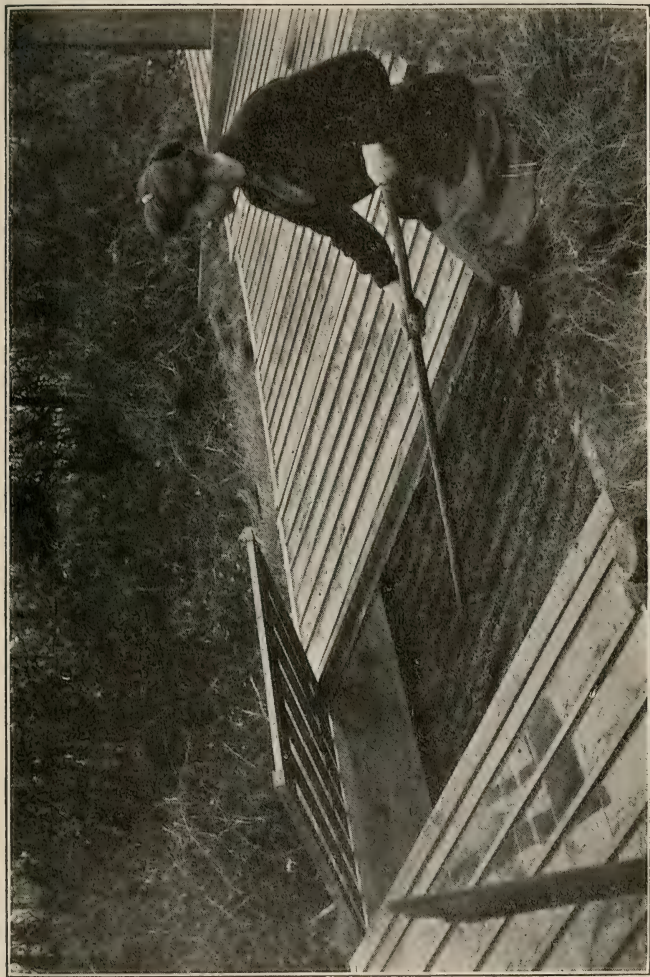
The tillage of land which is intended for the culture of vegetables usually begins by plowing. In small home gardens the spade is often employed instead of the plow, but its use is much more laborious and very little better than the plow. If coarse stable manures are to be applied they should be spread on the ground before it is plowed. Manures which have been materially changed in texture by decay may often be applied to the best advantage after the land has been plowed. When the most intensive systems of gardening are adopted, and the spade is used for the first tillage operation, it is not unusual to work the manure into the soil as spading proceeds. This method, however, is much more common in England than in the United States. Here the general custom is to broadcast the manure on the surface of the ground before plowing or spading, or perhaps all or a part of the manure is raked or harrowed into the soil after it is plowed or spaded.

Fall plowing is often an advantage in vegetable gardening. The rough, unbroken surface holds the snow and water during the winter and

early spring and if harrowed the first day in the spring when it is sufficiently dry the spring supply of moisture will be greater than in spring-plowed land. The physical condition of heavy soils is usually improved by fall plowing, which makes them more porous and friable and easier to work. Vegetable matter plowed down in the fall is well decayed by spring and is of greater value to the crop that follows. Fall plowing often makes it possible to plant earlier in the spring and thus relieve the pressure of spring work. Fall plowing also exposes insect enemies to freezing weather which helps to reduce their ravages. In the North, where the land is frozen to a considerable depth throughout the the winter, fall plowing is much more desirable than in the South, where the land is subject to leaching throughout the winter.

All spring plowing should be done at the earliest possible date. It is important, however, to wait until the land is dry enough to make physical injury impossible. The soil should be plowed as deeply as possible without bringing to the surface hard, unproductive subsoil.

While deep soil is important, especially from the standpoint of soil moisture, it is preferable to have a depth of seven or eight inches of



Cold frames may be used profitably in growing onions, beets, radishes, and other low-growing crops; with a small hoe there is no difficulty in cultivating the ground between the rows.

highly enriched soil to ten inches or a foot of soil of only medium fertility. If a greater depth of soil is needed, a very small quantity of subsoil may be plowed up each year without detriment until the required depth is obtained. When this is undertaken, stable manures should be used more freely.

Ordinarily, the harrow should be used as soon as possible after plowing in order to retain soil moisture and to pulverize the soil. The kind of harrow that should be used immediately after plowing will depend upon the character of the land. The light sandy soils may be reduced readily by the use of any kind of a harrow. The heavier clay soils require disk or cutaway harrows for the best results and sometimes, especially if the land is quite compact, spring-tooth harrows are necessary to secure the proper depth of fine soil. If stony areas must be used for vegetables, the spring-tooth harrow will be found essential in their preparation for planting. The acme harrow is a good pulverizer and also it has splendid leveling action.

Spike-tooth harrows are not used as much as formerly, but have been superseded by special makes like the Meeker smoothing harrow. This implement contains 58 small disks mounted on four rollers. It is used exclusively as a

finishing harrow, and is as effective as a hand steel garden rake. It pulverizes the smallest clods to the depth of three or four inches and leaves the surface smooth and even. This harrow should be employed by all garden makers who require the use of horse implements. Plank drags are also exceedingly valuable in pulverizing and leveling the land preparatory to seed sowing or transplanting.

Frequent cultivation of garden crops is essential to success. No rule, however, can be given as to the frequency of tillage, for this depends on the type of soil and its moisture content as well as on many other conditions. There is no question about the importance of using the cultivator often enough to prevent hard baking and to destroy all weeds before they have made much of a start. It is generally conceded that tillage should follow every rain if the ground is dry enough and between rains if the intervals are of long duration. It is seldom, perhaps, that the cultivator is used more frequently than is necessary for the best financial results.

The spike-tooth and narrow-shovel harrows are most popular among vegetable growers because they are the best pulverizers and conservers of soil moisture. In most instances the one-horse cultivators are more serviceable, al-

though the riding cultivators can often be used to advantage on large plantations, especially for such crops as sweet corn, potatoes, cabbage, and tomatoes. Hillers and shovels of various descriptions may be obtained and attached wherever they are considered an advantage.

Hand-wheel cultivators in a great variety of types may also be obtained. The more common forms, such as are sold by seed-houses, are highly satisfactory. They are great labor-savers and should be more generally used by farmers and village garden makers who rely too much on ordinary hand-hoes. If all vegetables are planted in straight rows, it is remarkable how quickly a large garden may be worked with either a single or double-wheel hoe. The single-wheel hoes are made to use at the sides of the rows while the double hoes straddle them. It will be seen at once that cultivation may be accomplished much more rapidly with double hoes, provided the character of the crop and the stage of growth, as well as the contour and condition of the land, will permit their use. Extensive commercial gardeners should have both types of hand cultivators, while the single-wheel hoes will be found more serviceable in small gardens where they must be used under a great diversity of conditions.

Whether hand or horse cultivators are employed a certain amount of hand-hoeing is nearly always necessary to keep the land free from weeds and to maintain the best conditions for plant growth. Every gardener should have an assortment of hoes, including the hilling-hoe, rake-hoe, scuffle-hoe, and narrow weeding-hoe. Promptness in the use of hand-hoes is exceedingly important from the standpoint of economy in labor. If this operation is delayed until the spaces between the plants become hard and weedy, much more labor will be required to break up the ground.

There are two classes of weeders, namely, those which are drawn by horses and the small, hand type. Horse weeders may be used in cultivating sweet corn, potatoes, and a few other crops for a short period after they have been started. They are great labor-savers as compared with cultivators and have the additional advantage of stirring the ground between the plants in the row. If the ground becomes quite hard after heavy rains, sometimes spike-tooth harrows can be used to advantage instead of horse weeders.

There are probably ten or more different kinds of hand weeders on the market. These are small tools, seldom more than a foot in

length, that are used between plants in the rows. Some contain teeth or prongs, while others have blades that vary greatly in form. They are especially valuable for such crops as onions, beets, radish, carrots, and other vegetables which are grown close together.

All garden tools, when not in use, should be kept under cover. They should be cleaned when put away, and the iron parts of the smaller tools oiled at the close of each season, if it is desired to protect them from rust. An occasional painting of the wood parts will prolong the life of the tools and implements.

CHAPTER VI

STABLE MANURES AND COVER-CROPS

THE producing power of any soil depends more on its supply of humus or vegetable matter than on the amount or character of plant food which it contains. Humus increases the capacity of soils to retain water; elevates their temperature; aids in important chemical changes; creates favorable conditions for friendly bacteria; improves soil structure; and reduces the labor of tillage. It may be seen at once that no effort should be spared in securing and maintaining a liberal supply of humus.

Market gardeners depend almost wholly on stable manures as a source of humus. Crops follow each other in such close succession, and the plants stand so close together, that there is no opportunity to grow cover-crops. As a source of humus, stable manures are superior to cover-crops or green manures, because they are partly decayed when applied to the soil and are

of greater value to the crops that follow such applications than green manures would be if plowed under immediately before planting vegetables.

Stable manures are often the cheapest source of plant food. Sometimes they may be had at city stables for the hauling, and in many instances the prices charged are very reasonable. The value of the actual plant food which city livery-stable manures contain probably seldom exceeds two dollars a ton. Intensive gardeners often pay this price and sometimes more for horse manure delivered on their home railroad sidings.

Practically all the manure purchased by market gardeners at city livery stables is horse manure. It is drier than most other manures and requires great care to prevent the loss of ammonia which it contains. Cow manure is slower in its action and may be safely applied to the land nearer the time of planting than horse manure. Stock-yard manure is often available at reasonable prices. Hog manure is also slow in action and is valued by growers of vegetables, but it is seldom available in large amounts. Sheep manure is rich in nitrogen and acts very quickly. Its high content of nitrogen and fine texture make it a favorite manure for garden-

ing, although large quantities cannot often be obtained.

Of all the farm manures, hen manure is the most valuable because of its large content of nitrogen, potash, and phosphoric acid, and its fine texture. It has long been regarded as especially effective for the growing of onions and other vegetables which require a large amount of nitrogen. The United States Department of Agriculture places the following average values on the manure from different animals: cows \$2.02; calves \$2.18; horses \$2.21; hogs \$3.29; hens \$7.07.

In general farm gardening, it is usually best to apply stable manures as fast as they are produced in the barn or hauled from the city or railroad station. This plan is nearly always the most economical so far as labor is concerned. Gardeners must bear in mind, however, that fresh manure, especially fresh horse and poultry manure, applied immediately before the planting of certain crops, is almost certain to result disastrously. Fresh manures are likely to cause a rank growth of the tomato, pepper, eggplant, and the cucurbits.¹ With the root crops, such as the turnip, beet, carrot, radish, parsnip, and salsify, fresh manure not only causes a rank

¹ Any plant of the gourd family.

top growth but it is detrimental to the best development of the roots. There is no danger in applying large amounts of fresh manure to cabbage, sweet corn, and no doubt some other crops, any time previous to planting.

Market gardeners practicing the most intensive methods invariably compost most of the stable manure before it is applied to the land. Sometimes other materials of fertilizing value are added to the compost piles, but in modern gardening horse manure is used almost exclusively in the piles which are to be spread on the gardens or fields. Composting makes the manure finer in texture, destroys weed seeds, and promotes favorable chemical changes in the manure.

It is customary to stack the manure in large, flat piles, four feet deep or more and with perpendicular sides. When the heaps are made in this manner, there will be practically no leaching at the sides nor in the interior of the piles, and if water is applied with a hose whenever it is needed, there will be no burning or fire-fanging with an accompanying loss of ammonia. The texture of the manure will be greatly improved if the piles are forked over once or twice during the period of composting which may last from three to six months or longer if desired.

Six months is not too much time in which to obtain the best texture.

As previously indicated, coarse stable manures should be applied before plowing. If they are cut up with a disk harrow before plowing, it will be an advantage in plowing and to the crops that are to be grown. All of the manures of finer texture, like those from poultry, sheep, and hogs, as well as decayed horse and cow manure, should usually be applied after plowing and thoroughly mixed with the soil by a suitable harrow. Four-tine manure forks are generally employed in spreading manure, although the machine spreaders secure a more even distribution and do the work more economically.

The rate of application varies with conditions which must be taken into account. In farm gardening, when heavy clover sod is to be plowed for cabbage, sweet corn, and other vegetables which are cultivated with horses, ten tons of horse manure will often give most excellent results, especially when supplemented with commercial fertilizers. In the more intensive forms of gardening, much larger applications are common. It is not unusual to apply as high as 40 tons to the acre when a highly intensive system is followed, and sometimes we hear of

gardeners using 50 to 75 tons to the acre. Whether such excessive amounts are profitable or not is a much argued question. It is highly probable that 25 to 30 tons to the acre, applied annually and supplemented with commercial fertilizers, is ample to maintain the soil humus and to produce maximum crops.

If irrigation is possible, good crops may be grown with less manure, although it may not be a good business proposition to make any change in the amount of manure used because of the possibility of irrigation. It is seldom, perhaps, that vegetable growers apply or purchase more manure during the season than is profitable. In many instances sufficient manure cannot be obtained for as liberal applications as may be necessary for the best results.

Because of the impossibility and sometimes expense of obtaining large amounts of manure, vegetable growers have been forced to rely more and more on green manurial crops as a source of humus. It has been clearly demonstrated, too, that truck farms can be successfully operated without the use of stable manure. It has also been demonstrated that humus can often be obtained at smaller expense by the growing of manurial crops than by the purchase of stable manure. This is indeed a most fortunate con-

dition, for, with the increased use of automobiles and motor trucks, the supplies of city manure will be reduced, and more vegetables will have to be grown to meet the demands of the great centers of population.

There are three classes of manurial crops. First, those which are started with a grain crop, such as red clover with wheat. On general farms this is an ideal practice. If the land is in the proper state of fertility, there will be an excellent stand of clover and a heavy sod will be produced, which, when plowed under, provides the most favorable conditions for many of the vegetables. This type of vegetable gardening — that is, the growing of garden crops on general farms, where clover and grass are included in the rotation followed — will become more important. There is probably no other plan of furnishing organic matter so economically for the growing of vegetables.

Second, the organic matter of the soil may be maintained and increased by the use of catch-crops: that is, rye, crimson clover, vetch, or other crops, may be sown in the vegetable garden at the last cultivation which may be performed any time from about the middle of July until the first of September. The seed is sown broadcast and the cultivation will cover the

most of it. More or less of the catch-crop will be destroyed in harvesting the vegetables, but there will be enough left, if a good stand has been obtained, to greatly increase the soil humus. This plan is very popular in many gardening regions, especially where it is difficult to obtain stable manures. Crimson clover does reasonably well as a catch-crop on sandy soils. Being a legume, it acquires free nitrogen from the atmosphere, and this is used to great advantage by the vegetables that follow. Not less than fifteen pounds of seed should be sown to the acre. Rye is also largely used as a catch-crop. It grows in any kind of soil and makes a dense growth if plenty of seed is sown. Three bushels of seed to the acre will make a very dense growth. Rye and vetch are often sown together.

Third, in impoverished soils it often pays to start manurial crops by themselves and plow down one crop after another until the land is well enriched with organic matter. For example, rye may be sown in the fall and plowed down the next spring when about two feet high, and then followed with oats and Canada field peas sown together. The oats and field peas may be followed with red or mammoth clover, or rye, if there is any uncertainty about getting

a good crop of clover. Seed should be used with freedom, and about 500 pounds of a high-grade, complete fertilizer to the acre should also be used with each crop. Two or three thousand pounds of lime, applied after the oats and peas, will hasten the decay of vegetable matter and create more favorable conditions for clover by insuring an alkaline soil. Soybeans, cowpeas, and buckwheat are also grown for manurial purposes.

CHAPTER VII

COMMERCIAL FERTILIZERS

COMMERCIAL fertilizers are becoming more and more a necessity in vegetable gardening. Formerly, the growers of garden crops near all the centers of population were able to obtain horse manure from city stables for nothing, or at small cost, while now, liberal prices are usually charged and the available supply is very much limited. It is not uncommon for a commercial grower to pay from \$2.50 to \$3.00 a ton for manure delivered on the railroad siding, which may be several miles from the farm. Under such conditions, the use of stable manure is an expensive proposition, and, so far as plant food is concerned, commercial fertilizers would be found very much cheaper. The necessity of humus, of course, must be kept in mind, and, unless green manures or cover-crops are employed to maintain the supply of organic matter in the soil, some stable manure should be used annually.

An additional reason for the use of com-

mercial fertilizer in conjunction with manure is that the latter is an unbalanced plant food. It contains much more of nitrogen, if well preserved, than of potash or phosphoric acid. Some growers, therefore, rely mainly on manure as a source of humus and nitrogen, and supplement by the application of potash and phosphoric acid. Manure, too, must first undergo decomposition before it is available to plants, while some fertilizers, such as nitrate of soda, are available as soon as dissolved. This often gives fertilizers a marked advantage, especially when it is important to force a rapid growth. And the latter is often of very great importance. For example, when vegetables are matured and harvested in close succession, several crops may be grown on the same land in one season. Rapid growth is important also from the standpoint of quality.

While nitrogen is supplied in large amounts by the application of stable manures, it is usually profitable to use at some time or other during the growing season nitrate of soda or other commercial forms containing a large percentage of nitrogen. This element is especially important in the growth of leaves and succulent stems and, therefore, such crops as cabbage, kale, Swiss chard, celery, cauliflower, Brussels sprouts,



Wheel hoes are indispensable: they save time and reduce expense.

onions, spinach, parsley, endive, sweet corn, and asparagus are most benefited by its application.

The value of any given form of nitrogen depends largely on its availability. For this reason, nitrate of soda is used to a great extent by all classes of vegetable growers. It may be mixed with other materials or applied separately. A common plan is to use some nitrate of soda in a complete fertilizer applied before the crops are planted and also as top-dressings during the growing season. It is sometimes distributed in shallow furrows along the rows which are then filled. A favorite plan in small gardens is to sprinkle a teaspoonful or less about each plant of tomatoes, lettuce, cabbage, or other plants in need of additional nourishment.

Applications of nitrate of soda are especially valuable in the spring after crops have been started and before the ground is warm enough to promote rapid nitrification. Nitrate of soda is sometimes applied broadcast after the crops are started, regardless of the location of each plant. It is distributed with a swinging motion of the hand and arm, just as clover seed is sown by hand. If the foliage is perfectly free from dew and rain, there will be practically no danger of burning or injuring the plants because the ferti-

lizer rebounds from the dry leaf surfaces. There is no rule regarding the proper amount of nitrate of soda to use on an acre. Ordinarily, 100 pounds to the acre is sufficient, and if desired as many as three or perhaps four applications may be made during the season. In other words, if 100 pounds of nitrate of soda is used to the acre at intervals of about two weeks, the plants should be well supplied with nitrogen.

If plenty of manure and probably nitrogenous fertilizers have been used before planting, subsequent dressings of nitrate of soda may show no benefit. The gardener should be certain that his crops do not lack nitrogen at any time, for a shortage of this element invariably results in light yields.

Other forms of nitrogen are widely used among gardeners. Raw or steamed bone furnishes from 3 to 6 per cent. of nitrogen. Although the nitrogen in this form becomes available very slowly, it is a safe and valuable fertilizer. Dried blood contains from 6 to 14 per cent. of nitrogen and decomposes rapidly. Ground fish contains from 7 to 8 per cent. of nitrogen and is used extensively by truckers in coast sections. Tankage varies from 4 to 12 per cent. of nitrogen and is regarded as valu-

able for the growing of vegetables. When top dressings of nitrate of soda are not contemplated, a part of the nitrogen in the fertilizer applied before planting should be derived from a quickly available source, such as nitrate of soda, and a part from more slowly decomposing materials, such as dried blood, tankage, or ground fish.

While nitrogen is ordinarily the limiting factor in fertilizers for vegetables, phosphoric acid is absolutely essential. It hastens maturity and must be furnished in ample quantity to insure large yields. Greater emphasis is now placed on phosphoric acid in the growing of vegetables than ever before. This is due largely to the fact that practically all the soils of the United States are greatly deficient in phosphorus. Acid phosphate, derived from the treatment of rock phosphate, is the chief source of supply, although the animal bone meals are important. The acid rock phosphates range from 12 to 18 per cent. of available phosphoric acid. Floats, which are simply the untreated rock ground into a very fine state of division, may be used, but they are not so quick in their action and have not met with as great favor among vegetable growers as with general farmers.

Potash is especially important for the root crops like beets, carrots, kohlrabi, turnips, radishes, and parsnips. It also enters largely into the composition of most other vegetables. Clay soils do not need potash as much as light soils need it. Lime and vegetable matter in the soil help to release the natural stores of potash but their value in these respects is somewhat disputed. Muriate of potash, sulphate of potash, and kainit¹ are the most important sources.

The rate of application of commercial fertilizers depends on the character of the soil, previous crops grown, previous fertilizers employed, moisture conditions of the land, the importance of early maturity, possibility of irrigation, and the needs of the crops to be grown. In the most intensive types of gardening, it is not unusual to apply two tons to the acre. In the great Norfolk trucking region, a total of 3000 pounds to the acre annually is frequently used.

A ton of a high-grade, complete fertilizer for an acre of cabbage, sweet corn, potatoes, and many other crops is often a profitable amount to use, although the usual practice for such crops is to employ half this quantity, espe-

¹ Described as "a colorless to dark flesh-red hydrous potassium-magnesium chloresulfate."

cially if the land has been dressed with stable manure. As a rule, however, it is a safe business proposition to apply as much plant food as the crops can use to advantage, and this is especially true in market gardening which, next to vegetable forcing, is the most intensive type of vegetable gardening. When plans are made for a gross return of several hundred dollars to the acre, there should be no hesitancy in spending, say ten dollars more for fertilizer than what might be regarded as barely necessary for a good crop.

On the other hand, every vegetable gardener should be cognizant of the fact that dangers attend the use of excessive amounts of chemical fertilizers. In the Norfolk region, for example, it has been found that lands heavily fertilized annually with chemicals will, in time, become so acid that they will fail to produce satisfactory crops of some of the most important vegetables. The only safe course, therefore, when fertilizers are used in large quantity, is to apply lime as often as may be necessary to correct unfavorable soil conditions. It has been found exceedingly valuable in the Norfolk region where there has been an excessive use of commercial fertilizers. Ordinarily, one ton of burned lime will be ample for an acre.

If preferred, the ground limestone may be used instead of burned lime, but about twice as much will be needed to secure the same effect. No doubt, there are hundreds of acres devoted to vegetables which do not need more than half a ton of burned lime to obtain the most favorable soil conditions. The benefits of lime in correcting soil acidity, improving the physical properties of soils, destroying toxins, releasing plant food, and hastening the decay of vegetable matter, are so great that most gardens should be thoroughly limed at intervals of about four years.

It is unnecessary to discuss at length the methods which may be used in applying fertilizers. In small gardens, scattering with the hand is very satisfactory. For fields and large gardens, all sorts of fertilizer drills and distributors are on the market.

In purchasing complete fertilizer, the cost of a pound of nitrogen, phosphoric acid, and potash should be considered, and not the cost of a ton of the fertilizer. As a rule, the highest grade fertilizers are the best and most economical, from every standpoint. If desired, the materials may be bought separately and mixed at home. The whole proposition is exceedingly simple and the labor of home-mixing need not

exceed fifty cents a ton. A sand screen, flat-bottomed shovel, and barn scales comprise the equipment needed for home-mixing. Knowing the composition of each material, the gardener can soon determine just how much is needed to get a fertilizer of a required composition.

CHAPTER VIII

THE SEED SUPPLY

GOOD seed is one of the important factors in producing large crops of choice vegetables. Seeds can scarcely be considered good unless they meet the following requirements:

(1) Seed must be true to name, and not mixed. It is unfair for a dealer to make substitutions for varieties ordered without the consent of the purchaser. It is also dishonesty of the worst type for a dealer to mix turnip or cabbage seed with cauliflower seed, and no trustworthy seedsman is ever found guilty of such practice.

(2) Seed must produce the best type of the variety selected. The experience of practical growers and the investigations of seed growers and experiment stations show that there is marked variation in the standard varieties of vegetables. One strain of Jersey Wakefield cabbage or Earliana tomato may produce several tons more of cabbage and tomatoes to the

acre than other strains of the same varieties. In view of this fact, it does not matter so much whether one buys Jersey Wakefield or Charleston Wakefield cabbage, but it is of the greatest importance that the best strain be obtained of the variety chosen. The rank and file of our vegetable growers do not fully recognize the importance of planting the best strains of the leading commercial varieties. Ordinarily, vegetable gardeners simply buy seed regardless of the merits of the strains. If the seed is to be purchased, it is important to locate the best strains of the varieties desired.

(3) Seed must be viable; in other words, a large percentage should grow under favorable conditions.

(4) Seed must be free from weed seeds.

(5) Seed must be free from grit, or other impurities, or foreign materials.

Every grower of vegetables may add largely to his pleasure and perhaps to his profits by the breeding of the best garden seeds. Fundamental principles, however, must be recognized, or no progress will be made. A host of gardeners have made the mistake of selecting choice specimens here and there with little regard to the specific qualities of the plants from which they have been taken; or, worse yet, fine

specimens have been picked out in the packing house for seed purposes. It is a well-known fact that a very poor plant may produce a fine tomato or melon, but it is folly to save fruits from such plants for seed purposes. The only safe principle to follow to insure progress, or at least to maintain the excellence of a strain, is to recognize the plant as the unit.

When making selections for seed purposes, such questions as these should have consideration: Is the plant healthy and vigorous? Is it productive? Are its products satisfactory in size, shape, color, solidity, quality? Does it produce too much or too little foliage? Is it sufficiently early?

The breeder should have well-defined ideas of the points of the strain desired. It is important to make a record of such ideals for future guidance. Bear in mind, too, that plants differ greatly in their power to perpetuate their good qualities. This makes it important to keep a careful record of each plant from which specimens are selected. This is a very simple matter and may be worth hundreds or even thousands of dollars to the commercial grower.

Most of the garden seed used in the United States as well as in foreign countries is produced by men who make a business of growing seed on

a large scale. The quality and value of such seed depends wholly on the care and skill used in its production, as well as on the integrity of the dealer. It is gratifying to be able to say that considerable progress has been made in the improvement of seed offered by American dealers, yet there is room for advancement. Our country has never been able to grow satisfactory seed of certain classes of vegetables, such as self-blanching celery, and we have had to rely wholly on foreign countries for these seeds. At present, wars abroad interfere seriously in procuring imported seeds, and international complications will undoubtedly encourage the development of the seed industry in America.

It is interesting to note that many of the most successful commercial growers save their own seed. They do this not because it is cheaper or less troublesome than to purchase them, but because they are more certain of satisfactory results from the home-grown seeds. In some instances the growers have learned of peculiar market demands and these have been met by breeding seed which produces just the type of vegetable wanted by the consumers to be supplied. Again, by the skilful breeding of seed in the home garden or greenhouse, it is possible to grow vegetables of great uniformity in size,

color, shape, and quality. It would be folly, however, for anyone to attempt breeding his own seed without sufficient knowledge of the principles involved, and the lack of this necessarily places a handicap on a great many gardeners.

Seeds should not be harvested until they are practically ripe, or mature. Close watching is required with some vegetables to gather the seed just at the right time. If produced in pods or capsules, ripeness is indicated when they turn yellow. Prompt harvesting is important when this stage is reached, in order to avoid loss of seed from the bursting of the receptacles in the field before the stems are cut. The stems or plants are permitted to dry for a few days before threshing. Bright, sunny weather is desirable for all the processes of harvesting, drying, and threshing.

Some seeds, such as tomato, melon, and cucumber, are enveloped in a mucilaginous covering, and they must stand in their own juice for a few days, or sometimes longer, in order to loosen the covering by means of fermentation. The seeds are then easily washed in a tub, crock, or other convenient vessel. The heavy seeds settle quickly to the bottom, while the pulp, skin, and light seeds remain on top and may be

poured off. Several washings are necessary to obtain clean seed. Sieves are often used during the process of washing.

Whether the seeds have been cleaned by wind-milling or washing, they must be thoroughly dried in the sun, in sheds, or in well-ventilated rooms before they are permanently stored. An excellent plan is to spread them in thin layers in an open loft where they will not be molested by birds, mice, or rats. Care must also be taken that the seeds are not frozen before they are thoroughly dry, for this is certain to reduce their vitality, and it may completely destroy their germinating power.

Seeds may be kept in any room which is free from dampness. An ordinary living room is entirely satisfactory and the seeds may be stored in bulk or in paper or cloth bags.

When seeds are purchased, it pays to buy the best. The price should receive very little consideration. Make certain that there is nothing better on the market and then buy enough seed to last several years, provided it will retain its viability. In large commercial establishments this is an exceedingly important matter, and an increasing number of gardeners are adopting this policy.

The testing of novelties is always an inter-

esting proposition. We naturally like to see vegetables that are superior to those we have been growing. Unfortunately, however, perhaps 95 per cent. or more of the novelties are inferior to the old, reliable, and well-known standard sorts. And why discard old, tried friends for new ones which may serve us much less profitably? There is no possible objection to trying the novelties on a small scale, but it is folly to make large plantations of them or to rely upon them before we know their real merits.

Practically all the seed sold by reliable dealers possesses good germinating power. The safe policy, though, is to make a germination test of all the seeds to be planted, whether they have been purchased or saved at home. Much disappointment and great loss may be avoided by this very simple operation. Germination pans, plates, and various devices may be used to determine the viability of the seed, but the best method is to plant it under real conditions. Shallow boxes, such as the one described in Chapter IV, or cigar boxes, will be found convenient for this purpose.

It is desirable to plant two lots of seed from each packet or bag to be tested. With small seeds, such as lettuce, cabbage, and tomato, there

should be 100 in each row, and if the rows are four or five inches long there will be ample room for a germination test. As soon as the plants are all up, counts should be made and the percentage of germination determined.

One year old seed, if well preserved and planted under favorable conditions, will show about the following percentages of germination:

Asparagus	90	Okra	80
Bean	90	Onion	80
Beet ¹	140	Parsley	70
Cabbage	90	Parsnip	70
Carrot	80	Pea	90
Cauliflower	80	Radish	90
Celery	60	Salsify	75
Corn, sweet	85	Spinach	80
Cucumber	85	Squash	85
Eggplant	75	Tomato	85
Lettuce	85	Watermelon	85
Muskmelon	85		

Seeds vary greatly in their longevity. That depends on kind of vegetable, thoroughness of curing, and storage conditions. The following table shows the probable maximum time that seeds may be kept and then germinate satisfactorily:

	<i>Years</i>		<i>Years</i>
Artichoke	2	Cabbage	3
Asparagus	2	Carrot	1
Bean	3	Cauliflower	4
Beet	4	Celery	2

¹ Botanically a fruit, often containing more than one seed.

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	<i>Years</i>		<i>Years</i>
Cucumber	3	Parsley	3
Eggplant	3	Parsnip	3
Endive	2	Pea	3
Kale	2	Pepper	3
Kohlrabi	3	Radish	2
Leek	3	Salsify	2
Lettuce	4	Squash	3
Muskmelon	3	Tomato	3
Okra	3	Turkey	3
Onion	3	Watermelon	3

CHAPTER IX

MARKETING

IT is assumed that most of the readers of this little book have more or less interest in vegetable gardening from a commercial standpoint; therefore, the question of marketing should receive some consideration. Men who have had large experience, both in producing and selling, often claim that the sales end of the proposition is the more difficult. Certainly our agricultural colleges, farmers' institutes, and various classes of farm papers have given far more attention to the production of farm crops than to their satisfactory disposition.

We now recognize the fact that real problems confront the gardener in marketing his crops just as they do in growing them, and it is gratifying that the various forces in agricultural education are now making a serious effort to help solve these problems.

In the first place the grower must bear in mind that there are underlying principles to be ob-

served in the successful marketing of vegetables. The great principle involved is that no effort should be spared to please the man and his family who purchase either directly or indirectly the vegetables which you grow. This effort increases consumption and assists in holding prices. Any gardener who manages to get a good price for an inferior product, whether it is handled by a middleman or not, does an injury to the great fraternity of commercial vegetable growers. Whenever inferior vegetables find their way to the table of consumers, the effect is to limit consumption at the time and to discourage the housekeeper in placing further orders for vegetables of the same kind.

Successful marketing means that the consumer must be won and so well pleased that he will make additional purchases. This cannot be accomplished unless the vegetables are of high quality, attractive in appearance, and the containers honestly packed. Too much emphasis cannot be placed on the importance of attractiveness. If an article appeals to the eye of the buyer, there is seldom difficulty in making a sale unless the market is over-stocked. Every grower of vegetables should make a most careful study of the elements or factors which count for attractiveness. Vegetables must be graded

to show off to the best advantage. They should be uniform in size, color, shape, soundness, and ripeness. The packages must also be bright and clean, and with fancy vegetables it may pay to use tissue paper, lace paper, or other ornaments similar to those used by fruit growers.

Too much care cannot be exercised in harvesting vegetables. They should not be handled so roughly as to cause bruising. They should be harvested just at the proper state of ripeness to insure the best quality, and methods for their transportation to market in the best condition should be fully considered.

Tomatoes, for example, which are to be shipped long distances and probably held for a few days in wholesale houses, retail stores, and finally in the consumer's pantry before they are served on the table, must be picked in a practically green state. By this practice, quality is necessarily sacrificed, a fact which accounts for the good demand for home-grown, field, and greenhouse tomatoes when the markets are full of southern tomatoes.

The time of harvesting is most closely associated with the question of quality. A large percentage of the sweet corn which is sold on the city markets is either too green or too ripe. Comparatively few growers realize the great

importance of having every ear just right when it is sent to market. Millions of cantaloupes are insipid because they were picked before they are ripe, and many other examples might be given to show the necessity of marketing every crop at the proper time. When a grower sells at retail from the farm wagon, nothing will establish a friendly market more rapidly than to have every vegetable at its proper stage of ripeness to insure the highest quality.

To gather the crop, it pays to have convenient baskets furnished with strong handles. In large plantations, roadways should be provided at convenient intervals. These may be permanent roads or provided tentatively for each crop by planting strips of the earliest varieties which are removed before the main harvesting begins.

Any kind of a shed or farm building can be conveniently arranged for the packing of vegetables. The large commercial establishments have houses of special construction, and, though a great advantage, they are not absolutely necessary, especially on smaller places where vegetables may be produced as a side issue. Whatever the character of the building used,

there must be tables of convenient height to the workmen and also sufficient room for the storage of empty carriers as well as for those which have been packed ready for market.

One of the most important articles is a tank or tub to be used in washing vegetables and this means that there should be an ample supply of pure, fresh water. Cleanliness is one of the most important factors in preparing vegetables for market. Sometimes this can be accomplished by the use of a damp cloth, while in other instances it is necessary to use plenty of water. Such vegetables as peas and beans in pods do not often need washing, but immersion in a vessel of cold water gives them a fresh, bright, clean appearance and also helps to retain the plumpness of the pods until they reach the consumer. A brush as well as water is often necessary to remove the soil that may adhere to beets and other root crops.

An almost endless variety of packages are in use. As a rule, the smaller packages meet with greatest favor among consumers. Comparatively few people care to buy as much as a barrel of cabbage or potatoes or a bushel of tomatoes. The small packages are gaining in favor in all markets. They are especially pop-

ular if provided with a bale or handle so that the purchaser can carry the vegetables home without inconvenience.

If the vegetables are to be hauled or transported long distances to market, the carrying qualities of the packages must be taken into account.

The nesting ability of a package is also an important consideration. While selling a load of produce to retailers or consumers, it is very desirable to be able to nest or stack the empty baskets or crates so that they will require little space in the wagon.

Grading is universally recognized as a necessary operation in preparing vegetables for market. The number of grades depends largely on the requirements of the market to be supplied. Ordinarily, two grades will serve the purpose, although at times it pays to make three grades. The packages should be well filled, and the vegetables arranged as neatly as possible.

Hundreds of vegetable growers find that it pays to do more or less advertising. It may be the pasting of a brand or label on the package or perhaps on the vegetable, as when melons are labeled. Local newspaper advertisements are often effective. A bulletin board at the front gate or farm entrance may serve the purpose.

A business card in the interior of the package is one of the best means of advertising. Dodgers are sometimes found to be an advantage in making sales. Postal cards tastefully illustrated and with just the right comments are often very good.

Wagons are in most general use, although auto trucks are becoming quite general for the delivery of vegetables. Trucks possess decided advantages, especially when the hauls are long and the roads smooth, hard, and comparatively free from steep grades. Under such conditions, and when a large amount of produce is to be transported, they have been found more economical than transportation by horse power.

Co-operative buying and selling organizations are being successfully operated in various parts of the country and there is no reason why every community should not enjoy the advantages and privileges of co-operation.

CHAPTER X

INTENSIVE GARDENING

NO one type of vegetable gardening is best suited to all conditions. On thousands of general farms, and in scores of well-known trucking sections, highly intensive methods would not be found feasible. Approved field methods must be followed, involving moderate applications of manure or fertilizers, ample spacing between plants, and tillage sufficiently frequent to control weeds and to keep the ground in a friable condition. There are many locations where no other type of vegetable gardening would be found practicable or profitable. But, with the increase in land values and the general tendency to make every acre do larger duty, there is a demand for information on how to obtain maximum returns from a given area, and the purpose of this chapter is to present, in condensed form, the data needed to secure the very best results, whether a fraction of an acre or one hundred acres are under cultivation.

The best seed obtainable must be sown at the proper time and in sufficient quantity to give a perfect stand of plants. No possible chances will be taken by alert gardeners in planting seed of unknown quality, and enough of it will be used to start a plant at every point where a plant is wanted. To be absolutely certain of having a perfect stand of plants, it is sometimes desirable to sow very thickly with the idea of thinning or removing surplus plants. However, if the germinating quality of the seed is known, and the gardener has had experience in sowing, the distribution may be made so skillfully, and the amount of seed used will be judged so accurately, that the stand of plants will be satisfactory without resorting to thinning.

The intensive gardener will constantly bear in mind that humus is the life of any soil, and that there must be no lack of vegetable fiber in the soil, if the largest and the best crops are to be harvested. The trucker may conclude that ten or twelve tons of manure will be ample for at least a fair crop, but the intensive grower will place no limit on the amount of manure to be applied each year. Forty tons may be all that is needed, but, if he is convinced that seventy-five tons will increase net profits, there

will be no hesitancy in applying that amount. A highly successful vegetable grower at Cleveland, Ohio, has been using for many years 800 tons annually on twelve acres of land. Where succession cropping is followed, the amount to be used on an acre may be applied at various times during the year.

In the most intensive types of vegetable gardening, it is customary to compost all manures before spreading them on the gardens. This destroys weed seeds and makes the manure finer so that it mixes more thoroughly with the soil. As stated elsewhere, a rank growth of vegetables may be avoided by using rotten instead of fresh manures. Soils of rather low fertility may be radically changed and made exceedingly productive in one season by the free use of manure.

Instances are known of fertilizer being applied at the rate of two to four tons to the acre. It is doubtful, however, whether increased yields are often obtained by the excessive use of commercial fertilizers. It is highly probable that two tons of a high-grade fertilizer used annually to an acre of land, in addition to the stable manures applied, will supply all the plant food that could possibly be utilized by any system of cropping. When the maximum

fertility is desired, the safest policy is to be somewhat conservative in the amount of chemical fertilizers used and to apply manures and organic fertilizers, like dried blood and tankage, with greater liberality.

Tillage occupies an important place in intensive vegetable gardening. Yields are often limited because the soil has not been well prepared nor the crops thoroughly cultivated. The preliminary tillage for a crop demands that the soil shall be in a fine state of division to the depth of the plow furrow. Disking before planting often helps to make a satisfactory seed or plant bed, and this is especially true if there are surface applications of manure to be mixed with the soil.

Too much cannot be said concerning the necessity of stirring the soil often enough to prevent all weed growth and to keep the surface of the soil in an open, porous condition. A productive soil is always well aerated and tillage is the means of opening the ventilators. No rule can be laid concerning the frequency of cultivation for much depends on the texture and structure of the soil. Heavy soils require the most frequent cultivation.

It is universally conceded that water is the most important factor in plant growth. The

land may be most bountifully supplied with plant food, but if the content of soil moisture is inadequate the crop yields will be unsatisfactory. A constant and liberal amount of moisture is needed in the chemical and bacteriological activities of the soil. Large additions of manure are of great value in the building of a soil reservoir, and crops which are planted in a soil containing a large percentage of decaying vegetable matter will not suffer to the same extent from drought as crops which are grown in soils lacking in humus. Notwithstanding the tremendous value of humus in retaining soil moisture and of tillage in conserving it, irrigation must be relied upon to give absolute control of soil moisture conditions. The importance of irrigation is now universally recognized by all classes of vegetable growers who wish to make yields larger and crop production more certain.

Various methods are employed in the watering of garden crops, but the overhead system possesses the greatest advantages and may now be found in all of the important gardening sections of the United States. The distributing pipes may range from a few inches above the ground to a height which will permit man or horse to pass under without any interference.

The lines average about 50 feet apart and are fitted with small discharge nozzles at intervals of four feet. The distributing lines are connected with the water mains or submains by means of patent unions. A lever is secured at one end of each nozzle line by which the entire line is turned or revolved at will so that it is easily possible to water a strip of ground 25 feet wide on each side of the pipe. The lines may be several hundred feet long. The manufacturers of the supplies give full instructions for the installation and operation of the overhead system.

Intensive cropping means that the crops should follow each other in as close succession as possible. There must be no loss of time from early spring until late fall. Planting may begin in March or April and, if quick-maturing classes and varieties of vegetables are selected, four or five crops may be harvested from the same area in one season.

Succession cropping is often closely associated with companion cropping. For example, radishes, lettuce, and cabbage are planted together at the same time, early in the spring. The rows of early cabbage may be thirty-two inches apart and the plants sixteen inches apart in the row. Lettuce is planted in the rows al-

ternately with the cabbage, and a row of lettuce is also set midway between the rows of cabbage, the spacing of the plants being eight inches apart, or more if desired. Button radishes are drilled in rows between the rows of lettuce and the arrangement of the three vegetables will be as follows:

C	L	C	L	C	L	C	L	C
RADISH								
L	L	L	L	L	L	L	L	L
RADISH								
C	L	C	L	C	L	C	L	C

The radishes will be harvested first, and then the lettuce, and finally the cabbage. With careful spacing of the crops there will be little interference of one with another. In order to make a combination plan of cropping like this a financial success, there must be a satisfactory market, of course, for each vegetable.

Numerous plans for intercropping may be carried out with entire success. Little difficulty should be experienced in deciding on definite plans, if proper consideration is given to the essential factors. The gardener must take into account the time when each crop should be started; the approximate date when each crop will be ready for market; the space required

for each vegetable throughout the period of growth; the habit of each class of plants included in the plan; and the food and moisture requirements of the various plants considered.

CHAPTER XI

THE HOME GARDEN

THIS little volume would not be complete without a brief discussion of the home garden, although every chapter, except the one on marketing, is just as applicable to the home garden as to the commercial garden.

The importance of America's home gardens is very much underestimated. Were a monthly value placed on their products, it would amount to millions of dollars annually. Every farm has its kitchen garden, which occupies a prominent place in the feeding of the farmer's family. There are days and even weeks in some farm homes when the contributions of the kitchen garden, in addition to eggs, milk, bread, and butter, constitute the bill of fare. If the leguminous vegetables — peas and beans — enter largely into the diet, there will be little need of fresh meat, which is often so difficult to obtain in the country. The farmer and countryman, therefore, should make the most

careful plans for this — the most important — cultivated area of the entire farm.

Of equal importance is the vegetable garden of the villager and the suburbanite who may have difficulty in meeting the increasing expenses of a growing family. A Pennsylvania shopman was reared in a village, twelve miles from the town where he works. He supports a wife and several children. For several years after his marriage he lived in the village where he was reared, walking to his work very early every Monday morning and returning Saturday night. There were no trolleys or other means of transportation.

Believing that it would be better to live in the town where the shops were located, he rented a house and made the experiment — which it proved to be for a year or two — and then returned to the village. There was practically only one reason for his going back, namely, that four dollars a day would not make his family as comfortable in the shop town as in the village. Although a cow and chickens were kept at the village home, their value did not equal that of the large garden which was of great economic importance in the support of his family.

Chapter I presents arguments and suggests opportunities for all classes of people, rich and

poor, young and old, and those weary in mind and body, by which they may find rest, recreation, and health in vegetable gardening, and certainly almost our entire population can find at least some soil (perhaps only a window-box in the city flat) in which a few vegetables might be grown.

In home vegetable gardening there should be several distinct aims. Quality is of paramount importance. In the selection of varieties, the question should always be asked, are they of the highest quality? Otherwise, you are not justified in planting them, unless some special reason exists. We must not lose sight of the fact that rapid growth helps to secure high quality. As stated in another chapter, vegetables which are grown slowly are likely to be tough and fibrous, stringy and bitter, or otherwise unpleasant in flavor. If there is no check in growth from the day the plants are up until they are harvested, the quality should be of the best, if good varieties have been selected. Rapid growth depends on a constant and abundant supply of soil moisture and available plant food, in addition to frequent and thorough tillage.

Again, there should be an abundance of the vegetables which are in greatest demand on the

home table. If Golden Bantam sweet corn is a general favorite with the family, plant a generous area so that it can be served liberally as often as desired. The successful home gardener will try to cater to the wishes and desires of every member of the family. He will also strive to have the favorite vegetables during as long a period as possible. In this respect many gardeners fail. They do not realize the importance of planting at close intervals, so that there will be an unbroken succession of vegetables for the table. Too frequently there is only one planting of sweet corn, peas, etc., when there should be several of the varieties selected for the purpose of yielding a uniform supply over a maximum period.

Another fault of some home gardeners is that the assortment of vegetables is too limited. The fact that a few vegetables are preferred by the family is not sufficient reason for excluding all others. Some of the vegetables of minor importance, which are seldom seen on the market, are most palatable when properly prepared and served.

The home garden should be located as conveniently as possible to the residence of the gardener. A sandy loam is best, but any kind of soil may be quickly improved for the growing

of vegetables. Thorough drainage is absolutely necessary. A gentle slope to the south or southeast is preferable, but excellent results may be obtained on any exposure. A natural or artificial windbreak is of great value to protect vegetables in gardens which are swept by hard winds. The water supply, especially if irrigation is contemplated, should also have careful consideration.

Hotbeds and cold-frames, and perhaps a small greenhouse, are a great advantage. They make it possible to grow strong, early plants and to force to maturity vegetables like radishes, onions, and lettuce when the weather is too cool to grow them out-of-doors. A hotbed of two 3 x 6 foot sash, and a cold-frame of about four sash, will be found exceedingly valuable in any home garden.

Almost innumerable plans could be made, showing the arrangement of the various classes of vegetables in the home garden. The gardener is naturally anxious for his labor to accomplish as much as possible, and planting everything in rows running lengthwise of the plot will shorten the time required to drill, plant, and cultivate the area. Long rows are a special advantage in drilling and cultivating because the operator is not required to turn his

tools or implements so frequently. In gardens of good size the rows should seldom if ever be so close together that hand wheel hoes cannot be used. They are great labor-saving devices and permit the gardener to spend more time in weeding, spraying, or doing other work about the premises, and they also enable him to take care of a larger area.

The principle of rotation should be recognized as far as possible in the home garden. It is never desirable to plant cabbage, cauliflower, onions, or any other crop, in the same ground year after year. Such practice tends to increase and encourage the presence of club-root, and many other plant diseases, and insect pests.

In small gardens, companion and succession cropping may be used to great advantage. See Chapter X.

The perennial crops, such as rhubarb and asparagus, as well as the bush fruits and grapes, should be planted at one side of the garden where they will not interfere with the annual crops.

CHAPTER XII

CULTURAL DIRECTIONS

ARTICHOKE — GLOBE

(*Cynara scolymus*)

THE Globe artichoke is steadily gaining in popularity among American gardeners. It is a delicious and wholesome vegetable that should be more generally grown. It is easily propagated from seed or suckers. Seed sown in the spring will produce strong plants for setting in the permanent bed the next spring. Plant in rich, moist soil, rows three feet apart, plants two feet apart in the row. Cut the old plants back to the ground in the fall and mulch with about five inches of coarse manure.

ARTICHOKE — JERUSALEM

(*Helianthus tuberosus*)

The tubers of this vegetable, which may be served as pickles or cooked for salads, are easily grown. A very rich soil is not required. The tubers are usually cut into two or three-eye

pieces and planted in the same way as potatoes, the pieces being dropped about 15 inches apart in the row. After the tops are dead, dig the tubers or let them remain in the ground over winter. There will be no danger of injury from freezing.

ASPARAGUS

(*Asparagus officinalis*)

This vegetable of European origin has found a place in the gardens throughout America. It is regarded as one of our most important vegetables, from a commercial standpoint, and no home garden is complete without it. A tremendous quantity is sold for immediate consumption and a large amount is canned, so that this product is served throughout the year. Asparagus is of such easy culture, and is so thoroughly enjoyed by almost everyone, that there is little or no excuse for not having it in every home garden. Many, too, who do not lack land area, will find this a most desirable vegetable to grow in somewhat larger quantity than is actually needed to meet the demand of the home table, for it is likely that the surplus can be sold without difficulty to neighbors or in nearby local markets.

While a number of varieties are offered for

sale by American seedsmen and nurserymen, only two varieties need be mentioned here. Palmetto is unquestionably the best known and most extensively grown. It is prolific and produces large shoots of excellent quality. The plants are also fairly resistant to rust. Recently, a new variety, Reading Giant, has been introduced by the Asparagus Experiment Station of Concord, Massachusetts, which is regarded as practically immune from rust. It is highly probable that Reading Giant will become the leading American variety because of its power to resist rust.

Deep, rich, moist, sandy loams are the best soils for the growing of asparagus. Sandy soils are particularly desirable if a white product is to be grown. There is an increasing demand, however, for green "grass," and an excellent quality may be produced in any soil that is sufficiently fertile. A soil that will produce a good crop of corn will, with proper management, grow a good crop of asparagus.

After a plantation has been established, and unusually strong and productive plants are found here and there, it may pay to select your own seed from them. Many of the most successful commercial growers save their own seed. If desired, a few of the best male and female

plants can be isolated and used wholly for seed purposes. Amateurs as well as market growers will derive much enjoyment from producing their own seeds. See that the male plants are just as good as the female. It is preferable to select plants that produce relatively few large shoots, rather than many small ones. They should also be free from rust.

To propagate new plants, select a rich location in the garden or on the farm. Make it still richer by applying plenty of rotten manure, of any kind, before planting. After plowing, harrow or rake in a complete high-grade fertilizer, at the rate of not less than a ton to the acre. The soil should be in a perfect state of cultivation before any seed is sown. Make the rows two feet apart. Drop the seeds about two inches apart and cover them with an inch of soil. If unusually strong plants are desired, drop the seeds 3 inches apart. A hand seed drill may be used if a large number of plants are to be grown.

A desirable practice is to drop a radish seed every few feet. These will germinate quickly and the plants will mark the rows so that cultivation may be begun at once. The asparagus plants may not appear for a month because the seed germinates very slowly. Give thorough

tillage throughout the summer. Thin the asparagus plants, if a seed drill has been used in sowing. If necessary, top-dress the plat in July with nitrate of soda 100 pounds to the acre, if the plants are not growing satisfactorily. A plan more certain of good results is to top-dress with 3 or 4 inches of fresh horse manure, being careful not to let the manure come into contact with the tender seedlings.

The plants may be dug in the fall and stored during the winter in moist soil, sand, or sawdust. A convenient plan is to tie them in bundles of 50 and pack them in barrels which may be placed in a cool cellar or buried under leaves out-of-doors.

One-year roots are preferable to two-year roots. Experiments have clearly demonstrated that large roots are much more profitable than small ones. At The Pennsylvania State College, the largest roots, planted in 1908, produced in 1914, \$816.72 to the acre, and the smallest roots \$694.32 to the acre. The conclusion of the whole matter is that one is never justified in planting anything but the largest one-year roots. This means that the gardener should grow two or three times as many roots as are actually needed to plant the area in mind, select the best roots, and discard the others.

Much has been said about the relative productiveness of male and female plants. The former are regarded as more profitable. The trouble is that, because the plants do not flower until the second year, we cannot determine their sexes until they are so large that transplanting is unsatisfactory because it mutilates the roots badly. On account of this difficulty, the use of two-year roots is not considered practicable.

It is possible that the reader lives near a market which demands white asparagus. If so, it will be necessary to ridge the rows in order to produce long white spears. Perhaps the better plan would be to begin marketing small lots of green shoots and thus convince the consumers that the green spears are vastly superior to the tough, white product.

The home asparagus plantation will probably be kept for twenty years and the commercial plantings for at least ten years. In view of this fact, the soil should be prepared with the utmost care. While any good corn land will grow asparagus, the soil should be treated at least as well as it would be for a bumper crop of corn. Almost any quantity of stable manure may be used before planting. Ten to fifteen tons to the acre will be sufficient, although the yield will

likely be increased by using more, say twenty tons to the acre, in addition to 500 pounds of a complete fertilizer.

There is much difference of opinion as to how an asparagus plantation should be fertilized. It is highly probable, however, that at least ten tons of stable manure can be used annually to advantage. It is also likely that the commercial fertilizer should be employed in two applications, the first in the spring of the year before any asparagus is cut (the manure may also be spread at this time), and the second immediately after the last cutting of asparagus, which is ordinarily about the first of July. The fertilizer should contain not less than 4 per cent. of nitrogen, 6 to 8 per cent. of phosphoric acid, and the same amount of potash. The most intensive and successful growers apply not less than a ton of fertilizer annually.

If white shoots are to be grown, it is customary to allow from 5 to 6 feet between rows, and the roots are set about 2 feet apart in the row. If green spears are to be grown, it is unnecessary to have the rows so far apart: 4 feet is sufficient space between rows, although half a foot more of space is an advantage in cultivating, especially after the plantation is 8 or more years of age. Two by four feet apart

is regarded as highly satisfactory by some of the most successful growers.

Fall planting may be practiced, but spring is the better time. The land should be plowed no deeper than the ordinary furrow slice, nor should the roots be planted deeper than this. It is invariably a disadvantage to have the roots in the subsoil because they grow laterally, and they fail to find the proper nourishment and physical conditions in the subsoil which are necessary for the most rapid growth. Cover the roots at first with not more than 2 inches of soil and increase the depth of covering as the plants grow.

Thorough tillage should be given from early spring until it is impossible to get between the rows with a horse and cultivator. The most effective tool to use early in the spring, the first day the ground is dry enough to work, is a disk or cutaway harrow. This will cut up the soil and manure and secure good surface conditions before any asparagus is cut. The spring applications of fertilizer may also be made before harrowing the land. Various cultivators are used during the cutting season and some hand-hoeing is usually required to prevent weed growth. After the last cutting is made, about the first of July, fertilizer may again be applied

and the land disked. There need be no concern about the few shoots that are destroyed by the disk harrow. Others will take their place.

Asparagus must be cut every day in very warm weather, especially during the month of May, and usually every other day.

It is tied in bunches varying in size to suit the markets to be supplied. Most markets require bunches that weigh about 2 pounds. An acre should yield at least 2500 bunches a season. The price per bunch generally ranges from 15 to 25 cents.

The common asparagus beetle is the most destructive insect pest. It may be controlled in the nursery by spraying with arsenate of lead. Lure rows¹ in cutting plantations are often sprayed with a poison and this same material may be used after the cutting season. Air-slaked lime is valuable to use on the rows during the cutting season. Coops of chickens in and around the plantation will help to keep the beetles in check.

Rust is the only serious disease of asparagus. If it is prevalent in the plantation, cut the plants in the fall before the leaves drop and burn them. If there is no disease, it is better to defer cutting

¹ Rows left uncut for the purpose of attracting insects away from other parts of the bed.

the tops until early spring because they will help to hold the snow and they will prevent the soil from being blown away by hard winds.

BEAN

(*Phaseolus vulgaris* and *P. lunatus*)

This vegetable of American origin was grown by the Indians, and no doubt many varieties were grown in America before they became generally known in European countries. From a historic standpoint, no garden crop is of greater interest.

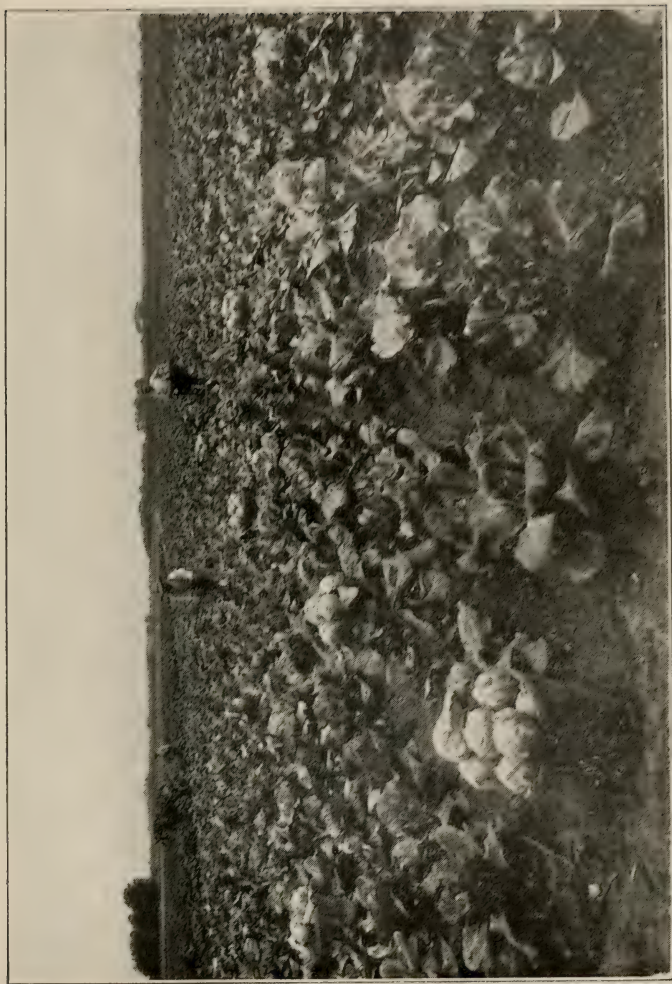
The following classification of beans has been suggested by Corbett:

CLASSIFICATION OF BEANS ACCORDING TO GROUPS AND TYPES

Field Beans....	{	Bush	Kidney	{	Colored
				{	White
		Marrow		{	Colored
				{	White
Garden Beans..	{	Pea		{	Colored
				{	White
		Pole or corn hill		{	Colored
				{	White
	{	Bush	Kidney	{	Wax
			Lima	{	Greenpod
		Pole	Kidney	{	Wax
			Lima	{	Greenpod
			Runner (Scarlet Runner)		

Garden makers as well as all classes of consumers should not fail to recognize the food value of beans as compared with that of other protein foods. One hundred pounds of lean beef contains 21.3 pounds of protein; 100 pounds of eggs, 14.8 pounds of protein; 100 pounds of dried lima beans, 18.1 pounds of protein; and 100 pounds of dried navy beans, 22.5 pounds of protein, or slightly more than lean meat; and the beans also contain 59.6 pounds of carbohydrates. It is seen at once that weight for weight the nutritive value of beans is greater than that of lean meat. All classes of green shelled beans also run high in protein and carbohydrates. Too much importance cannot be attached to bean culture from the standpoint of economy and efficiency in supplying food to our growing population. A larger quantity might be grown to be sold in the green state, to be dried and threshed, and to be canned for consumption at all seasons of the year.

A matter of gratification to the vegetable grower is that a crop of beans always leaves the soil in better condition than it was before the beans were grown. In other words, it is a soil-improving crop and not a soil-impoverishing crop. It traps the free nitrogen of the air and



Early cabbage is one of our most profitable vegetables. Note the perfect stand of plants

adds to the supply of this element in the soil.

There are so many excellent varieties of beans that it is difficult to single out a few of more than average merit. A mistake will not be made by ordering any of the leading dwarf wax-podded varieties described in the seed catalogues. There is probably nothing better than Burpee's Stringless among the dwarf green-podded varieties. Goddard is a most excellent midseason, green, shell bean, and is probably the best of its class. Golden Carmine meets with universal favor as a pole wax-podded variety. Creaseback is a popular early green-podded bean. Lazy Wife is also a very good bean of this class. Leviathan is a highly superior early pole lima bean, and King of the Garden is a good late lima. Fordhook and Henderson are widely cultivated bush lima beans.

Fortunately, the bean may be grown successfully in a great variety of soil types. The rich sandy loams unquestionably furnish ideal conditions, especially for the early crop. Any soil, however, which is well drained and well supplied with organic matter, will, when properly handled, produce good crops of beans. The light sandy soils are especially desirable for lima beans. The bush limas are not uniformly successful on heavy clay soils, nor do any of the

various types succeed on muck soils. Warm sunny exposures and protected locations are favorable to early maturity and to high yields.

The bean may be worked into any ordinary garden or farm rotation. It does remarkably well following clover. If preferred, the beans may follow corn, so that the rotation would be clover, corn, beans, and wheat. This rotation is popular in Michigan, where navy beans are grown on a large scale. In the home or commercial garden, there need be no hesitation in planting beans wherever and whenever there may seem to appear possibilities. The gross returns to the acre are seldom large, and the outlay in time and capital in growing a crop is small.

It is not customary to use large amounts of high-grade fertilizer for beans. The early plantings undoubtedly profit more from applications of nitrogen than the late ones. It is probable that about 4 per cent. of nitrogen should be used for beans early in the season, while less than half that per cent. would be sufficient later. From 6 to 8 per cent. of the mineral elements should be employed; 500 pounds to the acre is usually ample. If plenty of rotten manure is available to use in the hill for lima beans, no commercial fertilizer will be needed.

Beans can often be grown as companion crops with other vegetables. For example, if strawberries are planted very early in the season, bush beans may be planted between the rows of strawberries as soon as the ground is warm enough to start the beans. The beans will soon be ready to sell in a green state and the crops will not seriously interfere with each other. A great variety of garden cropping plans may be employed in which beans will constitute one of the crops.

We are so anxious to have real early beans for the home table that we sometimes take risks in planting before the ground is as warm as it should be for beans, and before the period for killing frosts has passed. If the beans rot in the ground, or the plants are killed by frost, the monetary loss is slight, and another lot of beans may be planted. It is usually safe to make small plantings a few days before the customary time for planting corn.

If they are to be cultivated with a hand wheel hoe, the bush varieties need not have more than 18 inches between rows, while for horse tillage the space should be at least 28 inches. Plants on the average of 3 inches apart in the row will give a good stand and should produce a satisfactory crop. Some growers prefer to drop 3 or 4

beans in hills 8 inches apart. This method is used largely in the bean fields at Norfolk. It facilitates the use of hand-hoes between the hills. From 4 to 6 beans of the pole varieties are planted in a hill, and the hills are usually 4 x 4 feet apart.

It does not pay to plant lima beans until the soil is thoroughly warm for they invariably rot if it is cold. It is usually safe to plant lima beans when the oak leaves are as large as squirrels' ears. Pole beans are generally supported by poles 6 to 8 feet high which are placed in the hills when the beans are planted. Wire trellises of various kinds are sometimes used to support pole beans. They are neater than poles and secure a more uniform distribution of the plants. When trellises are used, the beans are planted a few inches apart in drills.

Whatever the class of beans, they should have clean tillage during the entire period of growth. No work, however, should be done among the beans when the plants are moist or wet with dew or rain, because this may spread or disseminate the disease known as anthracnose, or more commonly as pod spot. If pure seed is planted in non-infected soil, the disease is not likely to occur. Spraying has not been found to be of any value in checking its ravages.

BEET

(Beta vulgaris)

The beet is universally grown in American and European gardens. By proper management it may be had fresh from July until November, and then the roots may be stored for consumption until late in the spring. The fleshy green leaves are delicious when cooked and served as greens.

The beet thrives in any soil that is rich and moist. The sandy soils, especially sandy loams, produce the smoothest and finest roots, though beets of excellent quality are often grown in heavy soil. The oval and turnip-shaped varieties are preferable to long sorts for growing in silt or clay soils.

There are many desirable varieties of beets. Crosby Egyptian is an early and important turnip-shaped variety. Eclipse is an extra early, round, smooth variety with small tops. It is prized for the home garden. Early Model has many friends among those who want early, round roots of high quality.

The seed of the beet is really a fruit containing several seeds surrounded by a corky pericarp. Since each so-called seed may produce several plants, great care must be exercised to prevent sowing the seed too thickly.

The soil should be prepared in the most thorough manner. It should be fine, mellow, and free from rubbish. The first sowing may be made early in the spring as soon as the ground can be prepared. From 6 to 8 weeks are required for the early varieties to attain edible size. Successive sowings should be made until the middle of August. Twelve inches of space between rows is ample for the early varieties, while a little more space is an advantage for later varieties with larger tops. The seeds of the early varieties should be dropped 2 or 3 inches apart in the row, while twice this space should be allowed for late varieties. Some growers prefer to sow more thickly and then thin the plants as may be desired.

The seed should be covered with about an inch of soil. Beet seeds germinate rather slowly, especially if the soil is lacking in moisture. Germination is usually hastened if the furrows, after sowing, are well firmed by the use of the hoe or feet, or perhaps the wheel of the seed drill.

Beets do not bear transplanting as readily as some other vegetables, although it is often done. The best time is during cool, cloudy weather, when there is an abundance of moisture in the soil. Sometimes the seed is sown under glass

and the plants transferred to the open ground, if very large beets are desired. A fertilizer analyzing rather high in each of the three elements usually applied will be found satisfactory for beets. The early beets are generally bunched for marketing, while the late crop is sold by measure. The roots are easily preserved in pits or in moist soil in a cool cellar.

BROCCOLI

(*Brassica oleracea*, var. *botrytis*)

Broccoli is not generally grown in America. The heads, resembling cauliflower, are inferior in quality to this vegetable and are more difficult to grow. Its culture should be attempted only as a late crop. Sow seed in the open ground in May and transplant 6 weeks later, setting the plants about 18 x 30 inches apart. Broccoli requires deep, rich, moist soil.

BRUSSELS SPROUTS

(*Brassica oleracea*, var. *gemmifera*)

This is a most delicious member of the cabbage family. Large buds or miniature heads are borne in the axils of the leaves along the tall stem. The "sprouts" are from 1 to 2 inches in diameter and are prepared in the same manner for the table as cauliflower. Brussels

sprouts should be much more generally grown in American gardens. Its culture is more difficult, as a rule, than cauliflower, but it is well worth the effort, in the home garden at least.

Sometimes seed is sown under glass and a very early product is grown. The more common practice, however, is to produce it as a late crop, in which case the seed should be sown in May. Six or seven weeks later the plants should be set 18 x 30 inches apart in rich, moist soil. Toward the end of summer, the leaves along the stalk are all removed except a tuft at the top. The leaf pruning which the plants thus receive induces the most rapid development of the "sprouts." The plants are not quite so hardy as the cabbage.

CABBAGE

(*Brassica oleracea*, var. *capitata*)

Cabbage is one of the oldest of our cultivated vegetables. It was probably in use 2000 to 2500 years B. C. European countries have always regarded it as one of their most important vegetables, and it is certainly one of the five most important vegetables of the United States. Large areas are grown in many southern sections to meet the spring and early summer demand, and northern sections produce immense

quantities of late cabbage which are distributed throughout the country. This crop offers special opportunities to those who have local markets that are poorly supplied.

There is no necessity of growing a large number of varieties. Jersey Wakefield, which produces hard, pointed heads, is the best known and most largely planted of the pointed type. Charleston Wakefield is a third larger and matures from three days to a week later. Copenhagen Market, a comparatively new variety, produces hard, round heads and is practically as early as Jersey Wakefield. This variety is well bred and is becoming widely popular.

Succession is an unusually good, flat-headed, midsummer variety that also does well as a late crop. The seed should be sown somewhat later than the large-headed varieties such as Drumhead, Flat Dutch, and Surehead. Danish Ballhead is the leading winter variety. It produces unusually hard, solid heads that keep under favorable conditions until late in the spring. Red Drumhead and Mammoth Rock Red are the leading red varieties, used extensively for pickling. Volga is an interesting, round-headed cabbage, somewhat resembling Danish Ballhead. It succeeds much better on limestone soils than Danish Ballhead.

Most of the cabbage seed grown in this country is produced on Long Island. Some seed, especially that of Danish Ballhead and Copenhagen Market, is imported from Denmark. Seed, especially of late varieties, may be produced at home without much difficulty. Choice heads of the type desired should be selected, buried with the roots on, and given thorough protection during the winter. The following spring the plants are reset, tops of heads cut crisscross, and stems well ridged with soil to keep the plants erect. When the seed pods have turned yellow, the plants should be cut and dried in the field for a few days and then stored under cover until dry enough to thresh. From 20 to 25 plants should make a pound of seed.

Cabbage is grown successfully on a great variety of soil types. The sandy soils are favorable to earliness, while the heavy soils are conducive to high yields. Limestone soils which are valued so highly for the general farm crops do not produce the heaviest crops of cabbage. The more open and porous soils seem to be more favorable to cabbage. An abundant and constant supply of soil moisture throughout the period of growth is absolutely essential and there should be no deficiency in available plant food. Clover sod is always an advantage, espe-

cially if it can be manured before the land is plowed.

Early plants are started under glass or in a warm window. The best plan is to sow in rows 2 inches apart, dropping about a dozen seeds to each inch of furrow. The furrows should be deep enough to cover the seed with about one-fourth inch of soil. Soil should be selected which is known to be free from the disease that causes club-root. If a greenhouse is available, the first sowing in the North should be made not later than February 1. When starting the plants in hotbeds, it is preferable to sow 10 days later. Keep the soil moist, but extreme care should be exercised to avoid over-watering, for this is certain to cause weak, spindling plants which will be tedious to transplant. They will also be more subject to damping off fungus than short, stocky plants.

The seedlings will be ready to transplant into the cold-frame in less than four weeks from seed sowing. It is customary to plant one and one-half inches apart each way, though more liberal spacing will produce stronger plants. An excellent plan is to use flats or plant boxes two or three inches deep. An inch of rotten manure should be placed in the bottom of each box before the seedlings are transplanted. The seed-

lings are watered and cared for in the cold-frame as explained in a previous chapter. They should be well hardened before setting in the field. Seed for the late crop is always sown in the open ground. Early preparation of the seed-bed is an advantage, because it conserves soil moisture and thus insures more prompt germination. In order to avoid club-root the plants should be started in soil that has not produced cabbage for a long term of years. The rows should be about a foot apart, and 6 to 8 seeds to each inch of furrow should result in a good stand of plants. The depth of covering the seed will depend mainly on the character of the soil. Ordinarily, half an inch of soil over the seed is sufficient. If the plants are too much crowded, they should be thinned as soon as possible.

Experiments at The Pennsylvania State College show that it is practicable to sow seed where the crop is to mature and thus avoid transplanting. Yields have been fully as high. The plan simply provides for dropping several seeds at each spot where a head is desired and after the plants are well started, thinning to one strong plant. This method appeals to those who do not have any particular use for the soil before the usual time for transplanting cabbage, and

who find difficulty in providing labor to do the transplanting. Of course, the expense of tillage in starting the plants is increased, and it may be more expensive to combat insect enemies when the little plants are scattered over a whole field instead of concentrated in a small seed-bed.

Late cabbage often fails because the land is plowed too late in the spring. If the seed is sown May 10, which is about the right date for many varieties, the seedlings will be ready to transplant the latter part of June. Now, if sod land is not plowed until a few days before this time, the ground will be almost certain to be wanting in soil moisture, and if rain does not fall very soon, successful transplanting will be a very uncertain matter. The only safe course to pursue is to plow the land early in the spring and to prevent the rapid evaporation of soil moisture by harrowing as often as may be necessary to maintain a dust mulch.

High fertility is absolutely essential to obtain large crops of cabbage. A soil that is deficient in nitrogen, potash, phosphoric acid, and soil moisture, or any of these constituents, cannot possibly produce a good crop of cabbage. A heavy clover sod will contribute largely to the success of the crop. Liberal applications of manure with or without sods are also exceed-

ingly valuable. Any kind of manure may be used to advantage. If a heavy sod of clover or timothy is available to be plowed down, 10 tons of manure should provide an abundance of vegetable fiber in the soil. In addition to this treatment, growers following intensive methods employ from 1500 to 2000 pounds of a high-grade fertilizer. It should contain at least 4 per cent. of nitrogen and from 6 to 8 per cent. of each of the mineral elements.

The late crop is not generally fertilized so lavishly, because the money returns seldom justify such heavy fertilization. On the other hand, wherever very good local markets are available it may be a profitable business proposition to fertilize the late crop just as heavily as the early crop. Sometimes nitrate of soda can be used at a great profit. Suppose there has been protracted drought after the plants are in the garden, that they make very slow growth or refuse to head properly, and rain is expected soon. At such a time nitrate of soda, sown broadcast at the rate of about 100 pounds to the acre, will be almost certain to have a most desirable influence. When applied broadcast, there need be no fear of the nitrate burning or injuring the plants.

The proper distance for planting in the

garden depends mainly on two factors, namely, the fertility of the soil and the varieties to be planted. Under average conditions, the very early varieties should have 26 to 30 inches between rows and the late ones 30 to 34 inches. Jersey Wakefield should have about 14 inches between plants in the row; Charleston Wakefield and Copenhagen Market, 16; Succession and Danish Ballhead, 18 to 20; and very large late varieties, 24.

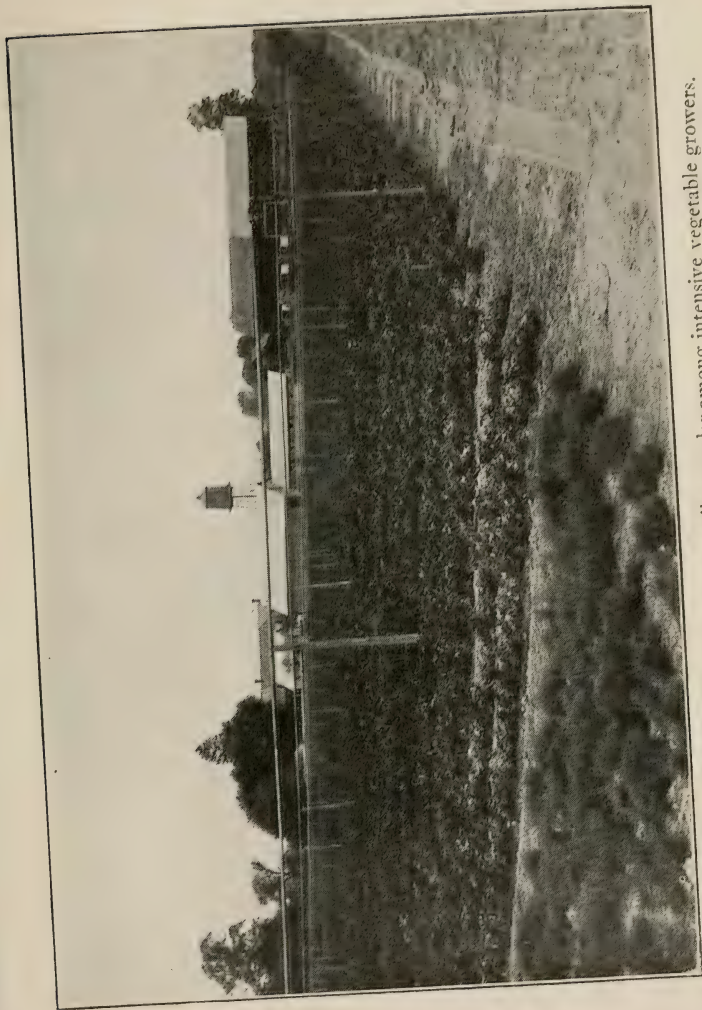
Cool, cloudy weather is most favorable to transplanting in the garden, especially if the plants have been pulled from the seed-bed. If they have been started in flats, as explained in a previous chapter, and each plant removed with a block of soil and manure attached to the roots, the plants will live and grow under the most unfavorable weather conditions. When a very early market is sought, it well pays to be as careful as possible in making the transfer without serious mutilation of the roots. If the soil is lacking in moisture, the sun shining brightly, and perhaps the wind blowing, transplanting for the late crop will be more certain if some water is used with each plant. Whatever the method used, the soil should always be brought firmly into contact with the roots.

Enough has been said about the importance

of soil moisture to this crop to render unnecessary the discussion of tillage. Of course, there should be absolutely clean tillage and the hand-hoe should be used sufficiently to control all weed growth.

Those who have a surplus of cabbage to sell will usually find it desirable to conform to methods of marketing that are used in the vicinity. A common practice is to sell early cabbage by weight on local markets, or sometimes by count, and also by measure. When sold by weight, it is generally important to allow the heads to reach full maturity. The late crop is nearly always sold by weight. It is not uncommon for the first few cuttings of early cabbage to sell for 3 cents a pound, while one and one-half cents is a good average for the season. One cent a pound is a profitable price for late cabbage. The outside leaves should be removed and the heads made to appear neat, whatever plan is used in marketing.

In the great cabbage-growing sections, specially constructed houses are used for the storage of this crop. Inextensive growers usually resort to burying, and a great variety of plans may be employed. One of the best and simplest is to place the cabbage in long wind-rows on top of the ground where there is good



Overhead irrigation is becoming universally popular among intensive vegetable growers.
The distributing lines are 50 feet apart.

drainage. Three heads are placed side by side, with the outer leaves under them. If desired, an additional layer of cabbage is placed on top of these. The plow is then used to turn two furrows against each side of the windrow and the work of burying is finished with shovels.

In most northern localities it is unnecessary to use more than 5 or 6 inches of soil over the cabbage, provided 3 or 4 inches of horse manure is spread over the soil after the ground begins to freeze. In extremely cold locations, more manure may be needed to give thorough protection. A very convenient plan by which to bury small quantities of cabbage is to fill ordinary barrels with the heads, cover top of barrels with boards, lay barrels on their sides and cover with soil and manure. Straw, hay, or old mats may be placed against the boards so that the cabbage can be removed without much inconvenience at any time during the winter. This plan is especially desirable for home gardeners who do not care to keep more than 50 to 100 heads.

The cabbage has a number of enemies which must be kept under control. The cabbage maggot, which attacks the roots, is one of the most serious. If the crop is not planted on the same

ground at closer intervals than five years, the maggot will not be likely to appear. In small patches, injections of kerosene emulsion or carbolic acid emulsion about the roots, as soon as the flies are noticed, will prove quite effective as a preventive measure. Disks of cardboard placed around the plants immediately after transplanting are also valuable. The cabbage aphid may be controlled by spraying the plants thoroughly on the upper and lower surfaces of the leaves with tobacco preparation or kerosene emulsion. The common green worm may be controlled by poisonous sprays or by fresh insect powder. Long term rotations are absolutely necessary to prevent club-root. The liberal use of lime is also an excellent preventive.

CARROT

(*Daucus carota*)

The carrot is not as popular as it should be in America. It is unquestionably one of our most wholesome vegetables, and, when properly prepared for the table, it is highly palatable.

The smoothest and most perfectly shaped roots are grown in sandy soil. If the home garden is not naturally sandy, a load or two of coarse, sharp sand, mixed with a small area of

the soil, will make it possible to grow better carrots as well as other vegetables requiring sand for the best results. Any soil, however, containing a liberal amount of organic matter, will grow good carrots, especially the short-rooted varieties. Of this class, Early Short Scarlet and Early Scarlet Horn are very popular. Chantenay or Model, Danvers Half-Long, Oxheart, and Rubicon are good mid-season varieties. Long Orange is the leading late, long-rooted variety.

Seed for the early crop should be sown as early in the spring as the ground can be prepared. A succession of short roots may be had throughout the season by making sowings of the early varieties at intervals of two or three weeks, or, if preferred, the larger and later maturing varieties may be used. For wheel-hoe cultivation, it is customary to allow from 12 to 14 inches of space between the rows. Plants of the early varieties should stand about 2 inches apart in the row, while late varieties should be spaced from 4 to 6 inches apart. A 4-6-8 fertilizer¹ will meet the needs of the carrot.

¹In speaking of commercial fertilizers the first figure designates the percentage of nitrogen, the second the percentage of phosphoric acid, and the last the percentage of potash which it contains.

CAULIFLOWER

(Brassica oleracea, var. botrytis)

The cauliflower is properly regarded as the most refined and delicate member of the cabbage family. No home garden is complete without it, and practically all market growers, who are sufficiently skilful to grow cauliflower successfully, find it a profitable crop. It is not an easy crop to produce on a commercial scale, and many market growers do not attempt its culture.

Cauliflower thrives best in a cool, moist climate. For this reason, it is grown most successfully in the North near large bodies of water. Although cool weather is favorable to the plants, they are less hardy than cabbage.

A deep, moist, rich soil provides ideal conditions. It is especially important that there be plenty of moisture at the time of heading.

Buy the best seed, because poor seed is held responsible for a large percentage of the failures of this crop. Seed for the early crop should be sown under glass about the first of March. Transplant the seedlings when they are not more than an inch high. Use plenty of rotten manure in the flats and see that the supply of moisture is ample and constant. Take all possible care to avoid checking growth.

Plant in the garden after danger of killing frosts. Late plants are handled in the same way as late cabbage, but with more care. A high-grade, complete fertilizer may be used to supplement a liberal application of rotten manure.

As soon as the heads begin to form, a few leaves are bent over them and fastened in any convenient way. Sometimes the leaves are tied together with twine, and sometimes toothpicks are employed to hold them in place. With the protection thus afforded from rain, dew, and sunlight, the heads will be pure white in color. If there is a surplus of heads to market, they should be packed carefully in crates or other suitable carriers so that the heads will not bruise each other. A fancy product should be wrapped in white, oiled paper.

CELERIAC OR TURNIP-ROOTED CELERY

(*Apium graveolens*, var. *rapaceum*)

This vegetable is prized in European countries, but it is not generally grown in the United States. It is valuable for flavoring, as a salad, and for cooking. The roots vary from 2 to 4 inches in size. Seed may be sown under glass and the plants set in the open ground after

danger of hard frosts. Sowings may also be made in the open ground. Celeriac requires the same general cultural treatment as celery.

CELERY

(*Apium graveolens*)

This vegetable, which has become so popular in recent years, should find a place in every home garden. It also affords splendid possibilities for intensive culture in a commercial way, wherever market conditions will justify the venture.

Celery growers are well acquainted with the two general classes of this vegetable, namely, the so-called self-blanching type and the green varieties. The self-blanching varieties are universally regarded as inferior in quality to the properly grown and thoroughly blanched green sorts. On the other hand, they are more easily and more profitably grown in many sections, and are most attractive when placed on the market. Winter Queen is one of the best green varieties. It should have a place in most home gardens. Giant Pascal is superb in quality, but because of the great height of the plants it is more troublesome to blanch. Probably nine-tenths of all the celery in the United States is Golden Self-Blanching. It is universally popular among

commercial growers, especially those operating on muck soils. White Plume is larger than Golden Self-Blanching but somewhat inferior in quality. Emperor Fordhook is a promising new variety.

Celery, like cauliflower, thrives best in a cool, moist climate. With proper management, however, it may be grown successfully in all parts of the United States, especially if seasonal changes are taken into consideration.

As previously indicated, the muck soils of the lake regions are used to a very great extent in the culture of celery. The bulk of the celery consumed by our great cities is grown in muck soils. We want every reader to realize, however, that it is possible to grow very fine celery in practically every garden. Any soil that is made very fertile and kept constantly moist should produce a good crop of celery.

The success of this crop depends largely on the quality of seed used. The utmost care should be exercised in buying the best seed, though it may seem rather expensive. Practically all of the seed of self-blanching varieties is grown in France. The United States has not been able to produce high-grade seed of the self-blanching varieties.

Seed for the early crop should be sown under

glass about the first of March. Celery seed is very small and should be barely covered and kept constantly moist to insure germination. An excellent plan is to keep a moist cloth or burlap over the bed until the seeds begin to sprout. As soon as the rough leaves appear, transplant into flats, spacing the seedlings one and one-half to two inches apart each way.

Celery requires a comparatively high temperature until the plants are set in the garden. They refuse to make rapid growth in the low temperature of the cold-frame. Low temperature may also stunt the plants and cause them to produce seed shoots instead of an edible product. It is better to keep the plants in the hot-bed or greenhouse, where plenty of heat can be furnished. Daily ventilation is also important. Plants for the late crop are easily grown by sowing seed in the open ground where the beds can be kept constantly moist. A little shading in any convenient way is a great advantage in starting late plants.

Ordinarily, the seed is sown thinly in rows a foot apart and the plants, when about 5 or 6 inches high, are transferred to the flat where the crop is to be grown. When the apple trees are in bloom is the proper time in most northern sections to sow seed for the late crop. The

plants may be set in the garden any time the latter part of June or during July. If the seedlings are rather tall and spindling, it is an advantage to clip them back from one to three inches before they are finally transplanted.

In the preparation of the soil the most important factor is to use an abundance of rotten horse manure. Intensive growers often use 30 to 50 tons of manure to the acre. If the ground has been manured freely for a number of years, it will be unnecessary to apply so much manure before planting celery. In fact, it is not unusual to grow very fine celery on land of high fertility that has not been manured at all immediately before setting out the plants. Celery is a shallow-rooted plant, and for this reason some growers prefer to use at least a part of the rotten manure as a top dressing after plowing, in which case a disk harrow should be employed until the manure is thoroughly mixed with the soil.

Commercial fertilizer is often highly beneficial in growing celery. If stable manure has been abundantly supplied, little or no benefit may be derived from the use of commercial fertilizer. Most celery growers, however, use more or less fertilizer. It should contain at least 4 per cent. of nitrogen and from 6 to 8 per

cent. of each of the mineral elements. The amounts to the acre vary from 1000 pounds to 2 tons. Ordinarily, a ton to the acre is ample, especially if a considerable quantity of manure has been applied.

Plants for the early crop should not be set in the garden until there is practically no danger of hard, killing frosts. In most sections the plants should not be set out before the 10th of May. The ground should be in a fine state of cultivation and it should be smooth and moist. The self-blanching varieties are usually set 3 to 4 inches apart in the row; while a third more space is allowed for green varieties. The distance between rows will depend on the methods employed in cultivating and blanching. If the soil is to be mulched or cultivated with a hand wheel hoe and the plants blanched by means of boards, 2 feet between rows will be ample and some of our most intensive growers do not allow more than 18 to 20 inches. In the "new celery culture," where blanching is accomplished by crowding, the plants are only 6 to 10 inches apart. If soil is to be used in blanching, then there should be at least 4 feet between rows, and 5 feet is not too much space for tall varieties like Giant Pascal. When transplanting into the garden takes place, the soil should be

pressed firmly about the roots. Cultivation should be given immediately after planting, and repeated often enough to maintain a fine, dust mulch.

The mulching system of culture is gaining rapidly in popularity because it is more certain of success than any other method. It provides for the placing, as soon as convenient after planting, of 3 or 4 inches of fresh horse manure, aerated in thin layers for a few days, between the rows of celery which need not be more than 2 feet apart. The manure should not come into direct contact with the plants, as it may burn them. About 40 tons of manure to the acre is required to be most effective. The benefits are: (1) Moisture is conserved more perfectly than by the most thorough tillage; (2) Tillage is rendered unnecessary; (3) Weeds cannot grow to any great extent; (4) Food is furnished the celery plants after every rain or the application of water.

Twelve-inch hemlock boards are the best for blanching the early crop. A board is placed on each side of the row and held in place by double wire hooks or stakes. Blanching in warm weather will require from 10 to 20 days. The same boards can be used a number of times during the season. When earth is used in blanch-

ing, ridging begins as soon as the nights become cooler in September. If the most erect plants are desired, it pays to press some loose soil about the base of each stem before a considerable quantity of soil is thrown against the plants.

If blights or celery diseases have been troublesome on previous crops, it will pay to spray with Bordeaux mixture, making the first applications in the seed-bed and repeating often enough to keep the plants well covered with the spray residue.

One of the best means of storing celery is to employ trenches, 10 to 12 inches wide and not quite as deep as the average height of the plants. The crop should be stored about November 1, or before there is severe freezing weather. See that the plants are free from dew or rain. Do not expose them unnecessarily to sunshine and drying winds. Stand them as close together as possible in the trenches.

Nail 10 or 12-inch boards together in the form of a trough and use this to protect the celery from the sun, rain, and freezing weather. Ventilation may be given by placing stones or blocks of wood under the edges of the boards. These should be removed when there are indications of cold weather. Additional protection should be given as necessary by cover-

ing the boards with straw, mats, or strawy manure. Celery may also be stored successfully in pits and cool cellars.

CHARD

(*Beta vulgaris*)

This vegetable is frequently called Swiss chard. The leaf blades are excellent when prepared as greens, while the stalks are very palatable when cooked and served like asparagus. The plants may be started under glass in the same manner as beets, though the more common plan is to sow in the open ground where the plants are to mature. Lucullus is a good variety. Rows should be not less than 18 inches apart. When the plants are 5 to 6 inches high, thin to stand about 3 inches apart, using the thinnings for greens. Later the plants should be thinned to stand 8 to 10 inches apart.

CHINESE CABBAGE

This vegetable has been but little grown in American gardens. It is valued both for salads and for cooking. Seed may be sown under glass and the plants set in the open ground in May, or, as is more common, sow the seed where the crop is to mature. Allow at least 2 feet

between rows and 15 inches between plants in the rows.

CHIVE

(*Allium schoenoprasum*)

This member of the onion family is of easy culture. The dense tuft of slender, hollow leaves is valued for flavoring. It may be propagated by dividing and planting the roots or by sowing seed early in the spring. The plants should be thinned to stand about 6 inches apart.

CORN SALAD

(*Valerianella olitoria*)

This vegetable is grown to a limited extent in American gardens. The leaves are used for salad purposes, greens, seasoning, and garnishing. It does better as an early spring or late fall crop because the plants are sensitive to heat. The seed should be sown thinly in rows about a foot apart, and the plants thinned to about 6 inches. It does best in cool, moist, fertile soils.

CRESS

There are three common forms of cress. Water cress is popular in all of our city markets. It thrives in pure, shallow, running water and may be grown in moist, shady places. The

plants are readily propagated from short pieces of the stems, planted along or near springs and brooks. Seed may also be scattered where conditions are favorable for germination. Garden or upland cress should be sown thickly in drills a foot apart. Upland cress is the least important of the cresses. It is most successful as a fall crop.

CUCUMBER

(*Cucumis sativis*)

The cucumber is prized in all American gardens. It is used most largely for slicing and pickling, though frying is fairly common.

White Spine, of which there are many varieties, is the best known and most largely cultivated variety. Chicago Pickling, Boston Pickling, and Fordhook Pickling are especially valuable for pickles.

Sandy soils produce the earliest crop and heavy soils the largest yields. It may be readily grown, however, in any soil which is moist and fertile. Seed is often saved from choice plants in the home plantation. If very early cucumbers are desired, the plants are easily started in the hotbed or greenhouse. Sowing should occur not more than 4 weeks before the proper time for planting in the garden.

An excellent plan is to fill 3 or 4 inch earthen or paper pots with a rich compost. Plant 6 or 8 seeds in each pot and thin to 2 to 4 plants. If possible, provide a night temperature of 60 degrees and 10 degrees higher during the day. Apply water sparingly for a few days before the plants are set in the garden and give them as much fresh air as possible, so that they will be properly hardened for transplanting out-of-doors.

The soil for cucumbers should be prepared as early as possible in the spring and the moisture conserved by harrowing the soil at frequent intervals. The plants thrive best in soils abounding in vegetable matter. This suggests the liberal application of stable manure. However valuable a complete fertilizer may be, it cannot be used as a substitute for manure. The fact is, if an ample quantity of rotten manure is employed, commercial fertilizer may not be of much benefit, though it is generally employed. It should contain 3 to 5 per cent. of nitrogen and 6 to 8 per cent. of each of the mineral elements.

Cucumbers are most commonly planted in hills. In moderately fertile, light, sandy soils the hills may be 4 x 5 feet apart, though 5 x 5 or 5 x 6 is generally preferred. Plenty of seed

is sown in each hill and the plants thinned to three or four. Some commercial growers prefer to sow in drills 5 or 6 feet apart and then thin the plants to stand about a foot apart. This plan gives each plant better opportunity for full development than when several are crowded together in the same hill. Whatever system is employed, it is generally desirable to use rotten manure in the hills or furrows before any seeds are planted. There should be clean tillage throughout the season.

The striped cucumber beetle is the most destructive insect enemy. The larvae feed on the stems and if present in large number will soon weaken them, and the beetles quickly damage the leaves. The most certain means to protect the plants is to cover the hills with netting of some kind. Air-slaked lime sprinkled on the plants is often an effective repellant.

DANDELION

(*Taraxacum officinale*)

Cultivated varieties are gaining in popularity for greens. They may also be blanched with soil for salad purposes. Rich soil should be prepared as early as possible in the spring and the seed sown in shallow drills a foot apart. Thin the plants to stand 6 inches apart in the

row. The first cutting is always the finest, though several cuttings may follow. Very early spring cuttings may be made from plants that are retained during the winter.

DILL

(*Anethum graveolens*)

This herb is quite popular for flavoring. The seed is especially valuable for flavoring pickles. Sow the seed half an inch deep in rows a foot apart and thin the plants so they will stand 6 to 8 inches apart.

EGGPLANT

(*Solanum belongena*)

This vegetable is steadily gaining in commercial importance and it is seen more frequently than ever before in our home gardens.

Black Beauty, New York Imperial, and Black Pekin are the leading dark-fruited varieties. Early Long Purple is considered earlier and hardier than any other variety and for these reasons it is most popular in northern sections where the large kinds do not thrive. The fruits are 9 to 10 inches long. Ivory is an interesting white-fruited variety.

The eggplant is very sensitive to cold and is produced at a great disadvantage where the

nights are cool and the summers short. Unfavorable climatic conditions require the greatest care in starting the plants and preparing the soil. Seed should be sown in a warm hot-bed or greenhouse about the tenth of March and the seedlings shifted once or twice into pots before they are planted in the field. An effort should be made to have strong, vigorous plants, which in most sections of the North should not be set in the open ground before June 1.

The soil in the garden should abound in vegetable matter. A shovelful or two of thoroughly rotted manure, placed in each hill when the plants are set, will help to provide ideal conditions. The large, pointed varieties should be planted 4 x 4 feet apart, while 2 x 4 or even closer will be satisfactory for Early Long Purple in northern sections. If growth in the garden is very slow, a teaspoonful of nitrate of soda scattered on the soil around each plant may prove beneficial, especially if the weather is abnormally cool.

ENDIVE

(*Cichorium Endiva*)

Endive is extensively grown in Europe and is becoming more common in American gardens. It is an annual, hardy to frost, and val-

uable for salad, for greens, for flavoring soups, and for garnishing. This vegetable is grown mainly as a fall crop. Giant Fringed, Green Curled Winter, and White Curled are the leading varieties. Seed for the fall crop should be sown in July or August; time of sowing depends on the locality. From 40 to 50 days are required for the crop to attain marketable size.

The plants should be thinned to 10 or 12 inches and there should be at least a foot of space between rows. If the plants are wanted for salad purposes the leaves should be well blanched, which may be accomplished by any plan which will exclude most of the light from the inside leaves. A common method is to tie the leaves together with twine. Late in the fall the plants may be covered with straw, or removed to a cold-frame or cool cellar. Boards may be used along the rows in the same way as explained for blanching celery.

GARLIC

(*Allium sativum*)

This perennial plant is a member of the onion family and is used mainly for flavoring purposes, because it is stronger in flavor than the onion. The small bulbs or cloves, as they are called, should be planted early in the spring,

an inch or two deep, 4 to 6 inches apart, with a foot of space between rows. The bulbs are harvested, cured, and stored in the same way as onions.

HORSE-RADISH

(*Cochlearia armoracia*)

Horse-radish is highly valued as a condiment and should have a place in every garden. It requires a deep, rich, moist soil. Sandy loams provide the best conditions. The plants are readily propagated from root cuttings. These are usually made from the small lateral roots which are removed from the large roots when the crop is prepared for market. The cuttings are 4 to 6 inches long. Inasmuch as these lateral roots are practically uniform in diameter throughout their length, it is customary to cut them square at the bottom, and then there is no uncertainty as to which end should be planted up in the garden.

The roots are planted 15 to 18 inches apart in the row, and there should be at least 26 inches between rows, if the ground is to be cultivated with a horse; 20 inches will be sufficient space for wheel-hoe cultivation. It is desirable to have 3 to 5 inches of soil over the roots, which are often planted obliquely. Some

of the roots should be dug and stored in moist soil or sand for use during the winter and the remainder of the crop may be left in the ground until spring.

KALE OR BORECOLE

(*Brassica oleracea acephala*)

Kale is an important crop in the Norfolk region and it is grown to some extent throughout the United States. It is a member of the cabbage family and is used mainly for greens, though the dwarf varieties are also valued for garnishing and bedding. It thrives in any good, moist soil. In the North the seed should be sown in May and then the plants will be ready for the table in the fall. The smaller kinds should have 8 inches of space between the rows and the larger varieties 15 inches. The greens are not as delicate as spinach.

KOHL-RABI

(*Brassica oleracea caulorapa*)

Kohl-rabi is also a member of the cabbage family and no more difficult to grow than cabbage. It is often called turnip-rooted cabbage. Green Vienna, Earliest Erfurt, White Vienna, and Purple Vienna are the best known varieties. The plants are readily started under

glass in the same way as early cabbage, and then set in the open ground the latter part of April or early in May. Plants of the smaller, earlier varieties do not need more than 8 inches of space in the row, while a foot is not too much room for the late kinds. There should be 15 inches of space between rows for hand-hoe tillage and nearly twice that amount for horse tillage. Seed for the late crop is sown in the garden where the plants are to mature.

LEEK

(*Allium porrum*)

A sheaf of leaves instead of a bulb is produced by this well-known member of the onion family. They are generally eaten raw, though sometimes cooked and used for flavoring. Sow seed in open ground early in the spring. In June or July, cut the tops back quite severely and transplant 4 to 6 inches apart in rows a foot apart. Ridge the rows in the fall in order to obtain long, white tender sheaves. The plants may be readily kept in storage in the same way as celery.

LETTUCE

(*Lactuca sativa*)

Lettuce is unquestionably our most important salad crop. It is grown on a large scale for

commercial purposes and our home gardeners are rarely without it.

Scores of excellent varieties are catalogued by the seedsmen. There is no best variety of any particular class. Grand Rapids is highly valued as a curly-leaved variety and is grown extensively under glass as well as out-of-doors. May King, All Heart, Sensation, and Way-a-Head are excellent heading varieties. Big Boston is the leading variety for planting on muck soils. Paris Cos is an excellent variety of the cos type.

Lettuce is one of our hardiest vegetables. When thoroughly hardened it will stand even lower temperature than cabbage.

The loose leaf or non-heading varieties thrive in any good, rich, moist soil. Head lettuce will not be successful in any soil that is not well aerated. For this reason it is most successfully grown in sandy soils. In the home garden, a load or two of sand, mixed with a small area of the soil, will greatly increase the chances of success in growing head lettuce. A liberal application of rotten manure is also exceedingly beneficial to this crop.

Seed may be sown in the open ground just as early as the soil can be prepared. Rows should be about a foot apart and the plants

thinned to 8 to 12 inches. Seed may also be sown under glass the latter part of February or early in March, the plants being grown in the same manner as explained for cabbage. They may be transplanted to the open ground fully as early as cabbage.

Commercial fertilizer can also be used to advantage in lettuce plantations. It should contain about 4 per cent. of nitrogen and 6 to 8 per cent. of each of the mineral elements. It is usually necessary to make sowings at intervals of several weeks in order to produce a succession of tender leaves or heads.

MARTYNIA

(*Martynia proboscidea*)

This vegetable is used to some extent for pickling. It is best grown by starting the plants under glass and transplanting them in the open the latter part of May. It should have a warm, sunny location to obtain the best results. The plants should be set from 3 to 4 feet apart each way.

MINT

Three kinds of mints, namely, peppermint, spearmint, and Japanese mint, are grown in American gardens. All are of easy culture. They should be sown in shallow drills 12 to 18

inches apart and the plants thinned to stand 3 to 4 inches apart in the row.

MUSKMELON

(*Cucumis Melo*)

The muskmelon has become one of our most important truck crops and the home garden is not complete without it. So many superb varieties are available that it is difficult to select a few of par excellence. The Rocky Ford type is the most important commercially, and Rocky Ford and Netted Gem are good varieties of this class. Among varieties which are highly prized, in addition to the ones named, may be mentioned Emerald Gem, Jersey Belle, Paul Rose, Osage, Eden Gem, Burrell Gem, and Hackensack.

The muskmelon is not at home in the warmer parts of the United States, but it may be grown in small quantities in practically every section. The fruits are so delicious that every garden maker should try to grow a few hills, though he may not be successful every year.

The sandy types of soils are considered best for muskmelons, largely because of their thorough drainage and their advantage in producing an early crop. While these are decided advantages, this crop is grown with signal success

on a great variety of soil types. In fact, some of the most extensive commercial plantations are located on clay and silt loams. An abundance of organic matter in the soil is highly essential and there should be a uniform supply of soil moisture throughout the season.

The greatest care should be exercised in securing well-bred seed. Where the summers are short and cool, it is often an advantage to save seed from home-grown specimens of vigorous, productive plants, thus obtaining in a few years a melon which will be more or less acclimatized to local conditions.

In most sections, where muskmelons are grown on a large scale, the seed is planted in the open ground where the crop is matured. For home gardens, however, and for sections where the soil and climatic conditions are unfavorable to this crop, there are distinct advantages in starting the plants under glass. The melons will then ripen a week to ten days earlier, which saving in time is a great factor where the summers are cool and of short duration. Insect pests are also more readily combated if the plants are of good size before they are set in the garden.

The plants may be started by various methods, but one of the best and most practical

plans is to sow 6 to 8 seeds in each 4-inch earthen or paper pot. This should be done about four weeks before the probable date when they will be set in the garden. The plants should be thinned to 2 or 3 in each pot. They should not be taken to the garden until after danger of hard frosts. In most sections, nothing will be gained by setting potted plants in the open ground before the latter part of May or first of June, though one must be governed entirely by local climatic conditions.

Soil that has been well manured in previous years for garden crops should produce good melons. A shovelful or two of rotten manure placed in each hill will be highly beneficial. If the seed is planted directly in the open ground, the manure should be thoroughly mixed in the hills or drills. The hills should ordinarily be 6 x 6 feet apart. If drills are employed, there should be 6 feet between rows, and the plants should be thinned to stand about 15 inches apart in the row. High-grade fertilizer may be used to supplement the manure if desired, and it should be mixed with the soil in the most thorough manner. Clean tillage from planting until harvest is essential. The plants may be protected from cucumber beetles in the same way as explained for cucumbers.

Where climatic, seasonal, and soil conditions are very unfavorable to muskmelon culture, a limited number of melons may be grown without very much trouble in cold-frames, using hot-beds if necessary to start the plants.

MUSTARD

(*Brassica*)

Mustard is used sometimes as a salad plant and also for greens, while the seeds are used in manufacturing the mustard of commerce. Seed may be sown any time from early spring until September, in rows a foot apart, and the plants thinned to 5 or 6 inches apart in the row. White London is one of the best varieties.

OKRA OR GUMBO

(*Hibiscus esculentus*)

This vegetable is grown to some extent in the South and occasionally in the North. The tender pods are used in soups and stews and sometimes cooked or served as a salad. The plants should be started under glass at about the same time as tomatoes, and planted in 4-inch pots, preparatory to setting in the garden. They do best in warm, fertile soil and should be planted about 2 x 3 feet apart.

ONION

(Allium cepa)

The onion is universally planted in home gardens, and it is one of our most important garden crops from a commercial standpoint. Wherever market conditions are favorable the onion offers exceptionally good opportunities for the employment of intensive methods with the hope of satisfactory returns.

The onion is planted more or less extensively in practically all American gardens. Danvers is probably the most largely grown. Southport Yellow Globe is a superior variety in some respects and is preferred by many commercial growers. Weathersfield is a highly popular red variety. Southport Red Globe is a favorite red onion wherever it is known. Silver King is one of the leading white onions. White Pearl is early and very attractive, but the bulbs are smaller than Silver King. White Queen is extremely early and produces small, pure white bulbs that are valued for pickling. White and Yellow Multipliers are planted largely in the South. Egyptian is a perfectly hardy variety, recommended for fall planting in the North.

Bulbs of the foreign class of onions, such as the Bermuda, Spanish, and Italian, are milder

in flavor than American onions. They are also larger but do not keep so well. Some of the varieties are considered especially valuable for planting under glass, the seedlings being transplanted to the open ground usually in May. Of this class, Prizetaker is best known and most extensively cultivated. White Italian Tripoli produces large, white, flattened bulbs. Giant Gibraltar and Denia produce very large bulbs, requiring more time to mature than Prizetaker. Red Bermuda, White Bermuda, and Crystal Wax are the best known varieties of the Bermuda class.

The American varieties are best adapted to northern conditions, though the foreign types may be grown if special care is exercised in starting the plants and in giving the crops the proper treatment.

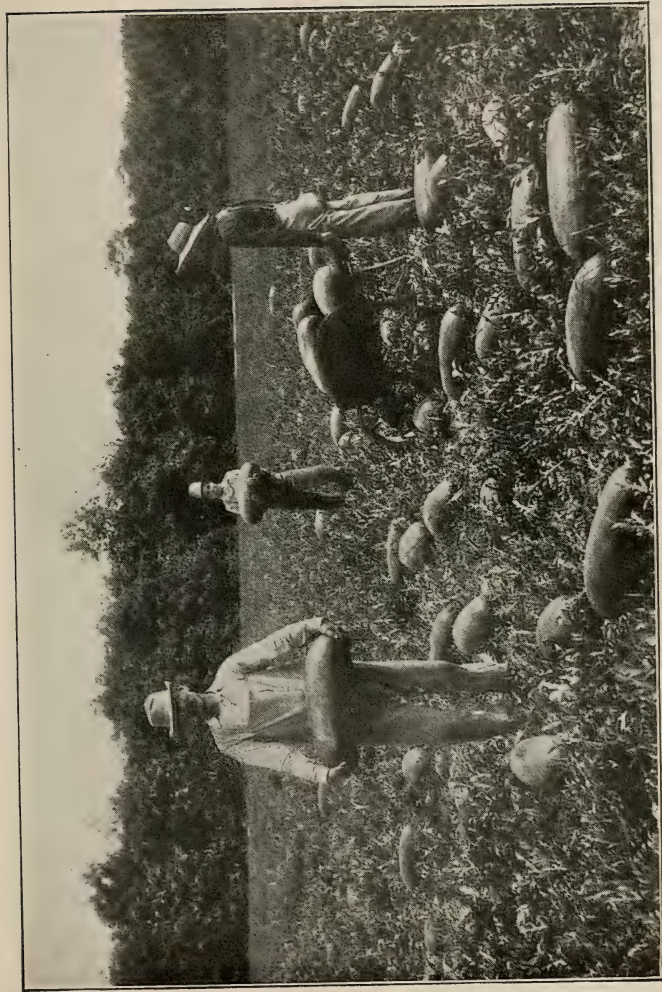
Land for onions should be as fertile as possible. The rich, sandy loams provide ideal conditions. Good onions, however, may be grown in any soil which receives the proper treatment. Heavy silt and clay soils are the most objectionable, though large additions of stable manure will make it possible to obtain fairly satisfactory crops. Fall plowing of such soils is advantageous. It is highly important to use land that

is practically free from weed seeds. This requires that clean tillage be given the ground the preceding year.

A favorite plan is to apply an abundance of stable manure for a cultivated crop, such as sweet corn, and then use the ground the next year for onions. If manure is applied direct for the onions, it should be as free as possible of weed seeds, otherwise the cost of hand-hoeing and weeding will be excessive. Manure which has been composted for several months will contain very few weed seeds.

If stable manure is used at the rate of 20 tons or more to the acre, and if the land has been liberally fertilized for several years previous to planting onions, it may not be necessary to use very much fertilizer. As a rule, however, a ton of fertilizer containing 4 per cent. of nitrogen and not less than 7 per cent. of each of the mineral elements — potash and phosphoric acid — will give a larger yield and increased profits. We must bear in mind that the onion is a heavy feeder and good crops cannot be obtained in soils of moderate fertility. It is a crop calling for the most thorough and intensive methods, particularly with reference to plant food and the supply of organic matter in the soil.

The bulk of the market crop grown in the



A good stand of plants and heavy setting of fruit are essential to high production in watermelon culture. Fields like this generally pay good profits.

United States is produced from seed sown in the open ground just as early in the spring as the soil can be prepared. This system is also used to a considerable extent in home gardens. Ordinarily, the rows are a foot apart. Four and one-half pounds of good seed will plant an acre. There should be not less than 8 good plants in each foot of row; if the soil is very rich and bulbs of extra large size are desired, there should be about 6 plants to the foot. In small plantations it is not a great task to thin the plants so that the stand can be regulated to suit the ideas of the grower.

When especially large and fine bulbs are desired, an excellent plan is to start the plants under glass. Early sowing is conducive to the best bulbs. If space is available in the hot-bed or greenhouse it pays to sow the seed of Prize-taker and other varieties of the foreign type about February 1, though a month later will do if earlier sowing is not feasible. Use rich, sandy loam, or any good garden soil, for starting the plants. Make the drills half an inch deep and three inches apart. Drop 10 to 12 seeds to the inch of furrow.

Any temperature which may be maintained for other vegetable plants will do for the onion. Be careful that the soil does not become exces-

sively dry at any time, for this condition, followed by the free use of water, may induce damping off. When the plants are about 5 inches tall, clip them back to 4 inches every week until they are set in the garden. This will make them stronger and stockier and they will be hardier when planted out-of-doors than if clipping is not practiced.

In home gardens the most common plan is to grow or buy sets and plant them out-of-doors just as soon as the ground is dry enough to work. Plants grow very rapidly from sets and mature bulbs earlier than it is possible to grow them from seed sown direct into the soil. It is the most convenient form of onion culture for amateurs or inexperienced growers. The rows should be a foot apart, if wheel hoes are to be used, and the sets should be forced well into the ground at intervals of about 3 inches. Plants started under glass should be spaced at the same intervals in the rows. Some gardeners space the sets or plants only one and one-half inches apart in the row and then every other onion is pulled green for bunching, and the others are left in the ground until full grown.

Hand wheel hoes should be employed as soon as possible after the crop is started. It is also necessary to do more or less weeding, for which

some of the hand tools will be found very valuable.

When most of the onion tops have become dead and shriveled, the bulbs should be pulled. Several rows are usually thrown together into windrows and allowed to remain on the ground for several days or perhaps a week if the weather is bright and sunny. If the bulbs are turned occasionally with a wooden rake, they will dry more rapidly. They are then stored under cover until fully cured.

Onions are easily kept during the winter in any dry, well-ventilated room. The bulbs may be spread in bulk on the floor, or, if preferred, placed in bags or crates. Sometimes the bulbs are permitted to freeze early in the winter and then covered with sufficient hay or straw to prevent thawing until spring.

Bunching onions are easily grown from seed by making very thick sowings. From 20 to 30 pounds of seed to the acre should be used for the production of bunching onions, while 40 to 60 pounds to the acre are used for the growing of sets.

The onion thrip, rust, and blight should be avoided as much as possible by rotation. It is seldom desirable to use the same ground year after year for onions.

PARSLEY

(Carum petroselinum)

This vegetable is highly prized for salads, flavoring purposes, and for garnishing. Extra Curled Dwarf, Moss Curled, and Fern-Leaved are excellent varieties. Seeds may be sown under glass or in the open ground. Good soil is required to grow fine plants. Sow in June for the fall crop. Set the plants 8 x 14 inches apart to provide ample space for them. They may be dug up in the fall and potted or planted in boxes in a sunny window of the kitchen or living room.

PARSNIP

(Pastinaca sativa)

This is one of the important root crops. It thrives in deep, fertile, moist, sandy soils. Roots of fair quality may be grown in heavy soils if the land is deep and well enriched by the application of rotten manure. Early Short Round is a valuable, very early variety. Guernsey and Hollow Crown are the standard varieties for the late crop. A long season is required for parsnips; the seed should be sown as early as possible in the spring and covered with one-half to one inch of soil. There should be at least 15 inches between rows, and the plants should be thinned to 6 or 7 inches in the row.

Some of the roots should be dried in the fall, for sale or consumption during the winter, and the balance of the crop left in the rows where it was grown until spring. The severest winter weather does not injure the roots.

PEA

(*Pisum sativum*)

The pea is invariably planted in home gardens and it is one of our important garden and truck crops. An enormous quantity is canned every year.

Of the early smooth peas, Alaska is one of the most prominent varieties. It is used extensively for canning. Extra Early is sold by all seedsmen and it is valued by those who want an extremely early product. Gradus, Thomas Laxton, and Nott's Excelsior are excellent early peas of the wrinkled type. The wrinkled peas are considered superior in quality to the smooth peas, but not quite so hardy. These varieties may be planted as early in the spring as the ground can be prepared. Improved Stratagem and Telegraph are excellent tall late varieties.

Soils abounding in vegetable matter produce the heaviest crops of peas. For this reason rotten manure may be used to advantage, applied

either broadcast or in the furrows. If the soil is rather thin, furrow applications before planting will be more effective. Complete fertilizers have also been found valuable for peas. Rows of dwarf varieties need not be more than 18 inches apart, while the late tall kinds should have 3 feet of space. Thirty inches between rows is a common distance for varieties of medium height. Seed should be sown thickly for heavy yields and covered with an inch or two of soil. Wire or brush supports should be used for the tall varieties.

PEPPER

(*Capsicum annuum*)

The pepper is gaining rapidly in commercial importance and it is much more appreciated in home gardens than it was ten years ago. This is particularly true of the mango or sweet pepper. Although the plants are susceptible to frost and do best at high temperatures, there is no reason why at least a few plants should not be grown in practically all American gardens.

The warm sandy loams are preferred for this crop. Of the hot or pungent varieties, Tabasco, Long Red Cayenne, True Red Chili, Bird Eye, and Hot Bell are best known. Of the mild-

fruited type, Bull Nose, Chinese Giant, and Ruby King are highly popular. Neapolitan is an early variety which possesses special merit for cool sections where peppers are not usually grown under the most favorable circumstances.

The plants should always be started in a warm hotbed or greenhouse. A high temperature is required both for the germination of the seed and the growth of the young plants. One or two transplantings should be made before the plants are taken to the garden. Plenty of rotten manure should be used in the hill with each plant, unless the soil and climatic conditions are very favorable. Commercial fertilizer can also be used to advantage in soils of moderate fertility. The plants should not be set in the garden until the ground is thoroughly warm and there is no danger of frost. Most varieties should be planted about 18 x 30 inches apart. Ridging the plants with soil will help them to stand erect and support their crop of fruit.

RADISH

(*Raphanus sativus*)

The radish is one of our most important root crops. It is grown largely as a spring and

early summer crop and the forcing industry, both in frames and greenhouses, is of considerable consequence. The earliest varieties attain an edible size in three weeks and this fact makes the radish a most popular vegetable among home gardeners. It is a cool weather crop, but may be grown under a wide range of climatic conditions. The soil should be highly fertile, and the sandy loams are best, though splendid roots may be grown in any soil which is well enriched with rotten manure. Commercial fertilizers are sometimes employed for radishes, but the main reliance is placed on stable manures, which should never be employed in a fresh state because they cause an excessive growth of tops at the sacrifice of roots.

Round Red Forcing and Scarlet Frame are excellent varieties of the small, red, button type. Earliest White is a superb early white variety. Beckert Chartier is a very good long-rooted red variety. French Breakfast is a bright scarlet radish with white tips. Radishes are planted from early spring until the first of September. The rows are generally about a foot apart and the plants range from 1 to 5 inches apart. The distance depends on the size of the roots. The seeds are covered with about one-half inch of soil.

RHUBARB

(Rheum Rhaponticum)

The rhubarb is one of the easiest crops to grow. The largest stalks are produced in deep, rich loams, but a good product can be grown in any garden soil of average fertility. Any kind of stable manure may be employed to advantage in growing rhubarb. If the supply of manure is limited, the greatest benefit will be derived by mixing two or three shovelfuls of rotten manure in each hill when the roots are planted. This vegetable is readily propagated from seed, but the most common plan is to divide old roots into separate pieces to start new plantations. The roots are usually planted 3 x 4 feet apart and covered with several inches of soil.

Victoria and Linnaeus or Strawberry are the leading varieties. If liberal applications of manure are made to the plants every year there will be little or no need for using commercial fertilizer. Nitrate of soda is often of special value in encouraging a strong and rapid growth.

RUTABAGA

(Brassica campestris)

This vegetable is sometimes called "Swedish Turnip." It is very similar in some respects to

kohl-rabi and requires about the same cultural treatment. Sow seed as early as possible in the open ground or start the plants under glass. Seed for the late crop should be sown the latter part of June or early in July. The roots should stand about 8 inches apart in the row and there should be at least 15 inches between the rows.

SALSIFY

(*Tragopogon porrifolius*)

Salsify is also known as "oyster plant" and "vegetable oyster." It is of easy culture. Sow seed in fertile soil as early as the ground can be prepared. Make rows a foot apart and thin the plants to stand 4 or 5 inches in the row. The roots may be left in the ground all winter, though some of them should be lifted for winter sales or consumption.

SAVORY

There are two kinds of savory, namely, summer and winter. The former is an annual and the latter is a perennial. The leaves of both kinds are used for seasoning. They are readily grown from seed sown in the open or under glass.

SHALLOT

(Allium ascalonicum)

The shallot is a member of the onion family, but is somewhat milder in flavor than the onion. It should have the same cultural treatment as the onion.

SPINACH

(Spinacea oleracea)

This is undoubtedly our best "greens." Immense quantities are grown in the South and shipped to northern markets very early in the spring. Rich, moist soils are required to grow heavy crops. Stable manure, well decayed, is especially valuable in the growing of spinach. It is a common practice in the South to sow seed the latter part of September or later, in rows 10 to 14 inches apart, and to thin the plants to stand 4 to 6 inches apart in the row. Spinach from this sowing is harvested very early the following spring.

In the North, the usual practice is to make sowings in the spring as early as the ground can be prepared. An excellent plan is to sow the seed on frozen ground in late winter and to cover at once with a half-inch mulch of fine, well-composted manure. The plants grow much better in cool weather than at high temperatures.

Norfolk Savoy, Victoria, and Long Season are well-known varieties.

SQUASH

The squash, outside of a few sections of the country, is not as highly appreciated as it should be. The late types are particularly valuable in helping to provide a wider range of foods for the winter months. Early White Bush and Mammoth White Bush are excellent summer varieties of the "patty pan" type. Summer Crookneck and Giant Crookneck are favorite early yellow-fruited varieties. Hubbard is one of the best winter varieties. Other winter varieties of special merit are Warty Hubbard, Golden Hubbard, Boston Marrow, and Delicata.

The squash should have about the same cultural treatment as the melon, though it is less difficult to grow. Early plants may be started under glass in the same manner as described for cucumbers. The more common plan is to sow seed in the open ground. The soil should be rich and well drained. The bush types of patty pan and crookneck may be planted in hills 4 x 4 feet apart, while those with running vines, like the Hubbard, should be spaced from 8 x 8 feet apart to 10 x 12 feet, distance depending on the

fertility of the soil. It is customary to plant 10 or more seeds in each hill, and then to thin the plants to two or three. Two or three forkfuls of rotten manure should be planted in each hill.

The winter squashes should be harvested before hard frosts occur, and with the utmost care, to prevent bruising. They may be easily kept in warm, dry rooms. Commercial storage houses endeavor to hold the temperature above 50. Squashes keep very well in crates placed near the cellar furnace.

SWEET CORN

(*Zea mays*)

It is unnecessary to discuss the importance of this crop, either from a commercial standpoint or from its value in the home garden. Nearly everybody is extremely fond of a strictly high-grade product. Fordhook is a very early small-eared variety. White Cob Cory is a general favorite and quite early. Golden Bantam heads the list in quality. It is becoming exceedingly popular because of its superb flavor.

Cosmopolitan is a mid-season variety that produces beautiful ears. Country Gentleman and Stowell Evergreen are well-known, prolific late varieties. Disappointment is often due to the use of poor seed. When possible it pays to

grow one's own seed, store it on the cob, and make germination tests of the kernels before planting.

The plants are easily started under glass by planting about 6 kernels in a three-inch pot three weeks in advance of planting in the garden. The plants should be thinned to 3 or 4. Cold-frames will do for this purpose. The soil should be well enriched by the application of manure. High-grade fertilizers can also be used advantageously. Any soil which will grow a good crop of field corn will produce good sweet corn. Clover or timothy sod, plowed in the fall or very early in the spring, provides excellent conditions for sweet corn.

Planting in the open ground, on a very large scale, should not occur until after danger of hard, killing frosts. In the home garden and in small commercial plantations, we may be justified in taking some risk by planting quite early, replanting if the plants are killed by frost. The first of May is not too early to do some planting in the North, and successive plantings should be made until probably the latter part of June, or even later in warm sections, if there is time for the crop to mature before killing frosts are likely to appear in the fall.

The distance between plants depends mainly on the vigor of the varieties to be grown. The smaller varieties like Fordhook and Golden Bantam do not need more than 9 inches between plants in the row and 32 inches is sufficient space between rows. For the late varieties, 1 x 4 feet is satisfactory. There should be clean tillage throughout the period of growth. It also pays to remove any suckers that may appear around the plants. The safest plan, especially in small plantations, is to use plenty of seed to insure a good stand of plants, and then to thin as much as may be necessary.

SWEET POTATO

(*Ipomoea batatas*)

The sweet potato is one of our most important truck crops. It is important in the Atlantic Coast States and throughout the South. Some of the best known varieties are Big Stem Jersey, Yellow Jersey, Red Jersey, Southern Queen, Pumpkin Yam, Georgia, Red Bermuda, Black Spanish, and Shanghai.

The sweet potato grows best at high temperature. For this reason it is an unsatisfactory crop for most sections of the North. The sandy soils are considered best adapted to sweet

potatoes. In the South, very good crops are grown in fairly heavy soils, provided the latter are well drained.

Sweet potatoes are usually propagated by growing "slips" or "sets." This is accomplished by bedding the tubers in fine, moist sand, and supplying sufficient heat to cause them to sprout. This may be readily done in green-houses or hotbeds. Ordinarily, a period of about six weeks is required to secure well-rooted plants. These are set in the open ground, after there is no further danger of frost, on ridges (though level culture is sometimes practiced), 36 to 42 inches apart, and the plants should be spaced 14 to 18 inches apart in the row. For this crop, thoroughly composted manures are valuable and complete fertilizers are often employed with excellent results. It is desirable to harvest the crop before frost. The tubers should be placed in warm, dry storage. Squashes and sweet potatoes are often kept in the same house.

THYME

(*Thymus vulgaris*)

This is a popular herb that is used for seasoning. It is easily propagated by means of seeds, root divisions, and layers. It grows well in any

good soil. The plants should stand about 6 inches apart in the row. The leaves may be used green or dried and preserved for winter use.

TOMATO

(*Lycopersicum esculentum*)

This vegetable of South American origin occupies a most important place in the long list of vegetables grown in the United States. Certainly, no home garden is complete without it and it is extensively grown on truck farms and general farms throughout the country.

While the tomato is easily injured by frost, and retarded in growth by cool weather, it may, by the employment of proper methods, be produced in practically every section where other vegetables are grown. If early varieties are selected and the plants grown to a good size under glass, ripe specimens may be picked in 40 days from the time the plants are set in the open ground. Again, in localities where late spring or early summer frosts are prevalent, the plants may be thoroughly protected, so that this is not a real barrier to their cultivation.

The tomato is at home in a great variety of soils. Sandy loams provide ideal conditions, though the crop is grown successfully on a large commercial scale in soils having the widest range

of physical properties. Thorough soil drainage is absolutely essential to success and there should be a reasonable amount of organic matter in the soil.

Earliana and Bonny Best are the most extensively-grown early varieties, both producing red fruits. Chalk Jewel, which ripens somewhat later, is also excellent. Stone and Matchless are unusually good late red tomatoes. June Pink is a well-known early pink variety, Globe a desirable mid-season purple variety, and Beauty and Trucker's Favorite are valuable late varieties of this class.

The seedsmen supply excellent seed of the leading varieties and it is also a simple matter to breed and save tomato seed in the home plantation. Seed for early tomatoes should be sown under glass not later than March 1, and many growers prefer to sow ten days to two weeks earlier. The seedlings should be transplanted into flats and later into pots.

When extra fine plants are desired, it is customary to make the final shift into 4 or 5 inch pots. The plants should be from 8 to 10 inches tall when they are taken to the field or garden. Smaller plants, of course, may be used with entire success, but the crop will not be so early. If the plants bear a few clusters of flowers and

perhaps a few newly-formed fruits when they are transferred to the garden, there will be no question about the earliness of the crop.

Clover or grass sods plowed very early in the spring provide most excellent soil conditions for tomatoes. The crop may also be grown successfully on land which was used the preceding year for other vegetables or general farm crops. Rotten manure can usually be applied to advantage. Commercial fertilizers containing liberal amounts of the three elements commonly found in complete mixtures are also beneficial. In most soils, 1000 pounds of a 4-7-8 mixture should meet the requirements of the crop.

The proper distance between plants depends on the varieties to be planted, method of training, and fertility of the soil. Ordinarily, the plants should be set 4 x 4 feet apart, if there is to be no pruning or training. In very rich soil, there should be more space. If the plants are to be formed and trained to single stems, they may be planted 18 inches apart in the row, and it will be unnecessary to allow more than 30 inches between rows, though more space is a decided advantage in cultivating with a horse.

In small garden plots, it is possible to get very good results by planting 20 x 20 inches apart, when the plants may be trained to single stems.

This plan of training is quite popular among home gardeners and is used to some extent by commercial growers. It simply consists in removing with the thumb and finger all side or lateral shoots as rapidly as they appear, thus inducing the growth of a single stem which is tied to a stake or wire trellis. When the plant reaches the height of about five feet the top is pinched off and no further growth of stem is permitted. This plan of training results in very early, large tomatoes that are clean and easy to pick. The plan is especially desirable for small gardens where ground is at a premium.

It pays to exercise special care in marketing very early tomatoes. An excellent plan is to wrap the fruits in tissue paper and pack them in baskets that will hold about 5 pounds.

When any of the fungous diseases of the tomato appear to a troublesome extent, the plants should be sprayed with Bordeaux mixture at intervals of two or three weeks from the time the seedlings are up until the crop is well matured. The flea beetle sometimes appears in great numbers soon after the plants are set in the open ground. It may be successfully repelled by spraying with arsenate of lead.

TURNIP

(Brassica rapa)

The turnip is one of our best root crops. It is of easy culture and does well in a great variety of soil types, the sandy loams being the best. The soil should be fertile and moist but well drained. White Milan, Red or Purple Top, White Flat Dutch, Purple Top White Globe, White Egg, and Yellow Globe are excellent varieties.

Though turnip seed is often sown broadcast, it is better to sow the seed in drills 12 to 18 inches apart and to thin the plants to 2 or 3 inches apart for early varieties and 4 or 5 inches for late varieties. The seed should seldom be covered with more than half an inch of soil. Sowings for the early crop can be made as soon as the ground is dry enough to work and for the late crop the latter part of July or early in August. The roots are easily preserved during the winter by storing them in a cool cellar and covering them with a few inches of moist soil or sand to retain their moisture, and thus prevent them from shriveling. They may also be held over winter by burying.

WATERMELON

(Citrullus vulgaris)

The instructions which have been given for the culture of muskmelons apply equally well to watermelons, except that the latter require more space. There are many good varieties. Among the best may be mentioned Kleckley Sweet, Kolb Gem, Cuban Queen, Halbert Honey, Dixie, and Sugar Stick. Cole and Fordhook are very early varieties. Baby Delight is an extremely small but prolific melon of good quality.

Watermelons may be started under glass in the same way as other cucurbits. The most common distance for planting is 10 x 10 feet apart. The hills should be made rich by the use of several shovelfuls of rotten manure in each. Use plenty of seed and thin to 3 or 4 plants in each hill.

APPENDIX

Number of Plants Required to the Acre at Various Distances.

1 in. x 10 in.....	627,269	18 in. x 2 ft.....	14,520
1 in. x 12 in.....	522,720	18 in. x 30 in.....	11,616
2 in. x 10 in.....	313,632	18 in. x 3 ft.....	9,680
2 in. x 12 in.....	261,360	18 in. x 4 ft.....	7,260
3 in. x 12 in.....	174,240	18 in. x 5 ft.....	5,804
4 in. x 12 in.....	130,680	2 ft. x 2 ft.....	10,890
6 in. x 12 in.....	87,120	2 ft. x 3 ft.....	7,260
12 in. x 12 in.....	43,560	2 ft. x 4 ft.....	5,445
12 in. x 15 in.....	34,848	2 ft. x 5 ft.....	4,356
12 in. x 18 in.....	29,040	3 ft. x 3 ft.....	4,840
12 in. x 24 in.....	21,780	3 ft. x 4 ft.....	3,630
12 in. x 30 in.....	17,424	3 ft. x 5 ft.....	2,904
12 in. x 3 ft.....	14,520	4 ft. x 4 ft.....	2,722
12 in. x 4 ft.....	10,890	4 ft. x 5 ft.....	2,178
12 in. x 5 ft.....	8,712	5 ft. x 5 ft.....	1,742
15 in. x 18 in.....	23,232	5 ft. x 6 ft.....	1,452
15 in. x 2 ft.....	17,424	6 ft. x 6 ft.....	1,210
15 in. x 3 ft.....	11,619	6 ft. x 7 ft.....	1,037
15 in. x 4 ft.....	8,712	6 ft. x 8 ft.....	907
15 in. x 5 ft.....	6,969	7 ft. x 7 ft.....	888
18 in. x 20 in.....	17,424	8 ft. x 8 ft.....	680

Quantity of Seed Required to the Acre.

ASPARAGUS, 2 ½ ounces to 100 feet of drill; 2 pounds should produce enough roots to plant an acre.

BEANS, dwarf, 1 quart to 100 feet of drill; 1 ¼ bushels an acre. Lima, ¾ bushel to an

acre. Pole, 1 pint to 100 feet drill; $\frac{1}{2}$ bushel an acre.

BEET, 1 ounce to 50 feet of drill; 4 pounds to an acre.

BROCCOLI, 1 ounce to 300 feet of drill; 2 ounces an acre.

CABBAGE, 1 ounce to 300 feet of drill; hotbed or greenhouse 1 ounce should produce at least 2,000 plants; outdoors, 1 pound should produce at least 20,000 plants.

CARROT, 1 ounce to 100 feet of drill; $2\frac{1}{2}$ pounds to an acre.

CAULIFLOWER, 1 ounce should produce 3,000 or more plants.

CELERY, $\frac{1}{3}$ ounce to 100 feet of drill; 1 ounce should produce at least 10,000 plants.

SWEET CORN, $\frac{1}{4}$ to $\frac{1}{2}$ pint to 100 hills; when planted in hills 1 peck to an acre.

CUCUMBERS, 1 to 2 ounces to 100 hills; 1 to 2 pounds to an acre.

EGGPLANT, 1 ounce should produce 1,500 to 2,000 plants.

ENDIVE, $\frac{1}{4}$ ounce to 100 feet of drill; $4\frac{1}{2}$ pounds to an acre.

KALE, 1 ounce to 300 feet of drill.

KOHL-RABI, 1 ounce to 300 feet of drill; 4 pounds an acre.

LEEK, 1 ounce to 100 feet of drill; 4 pounds an acre.

LETTUCE, $\frac{1}{4}$ ounce to 100 feet of drill; 3 pounds to an acre.

MUSKMELON, 2 ounces to 100 hills; 4 x 4 feet, 2 pounds to an acre.

ONION, seed, $\frac{1}{2}$ ounce to 100 feet of drill; 4 to 5 pounds an acre. Sets, 1 quart to 40 feet of drill; 8 bushels, and more if large, an acre.

PARSLEY, $\frac{1}{2}$ ounce to 100 feet of drill; 3 pounds to an acre.

PEAS, 1 to 2 pints to 100 feet of drill; $1\frac{1}{2}$ to $2\frac{1}{2}$ bushels an acre.

PEPPER, 1 ounce should produce 1,500 plants.

RADISH, 1 ounce to 100 feet of drill; 10 to 12 pounds an acre.

RHUBARB, 1 ounce of seed to 125 feet of drill; $3\frac{1}{2}$ pounds to an acre.

SALSIFY, 1 ounce of seed to 100 feet of drill; 8 pounds to an acre.

SPINACH, 1 ounce to 100 feet of drill; 8 pounds to an acre; broadcast, 30 pounds to an acre.

SQUASH, summer, 4 ounces to 100 hills. Fall and winter, 8 ounces to 100 hills.

TOMATO, 1 ounce of seed should produce 3,000 to 4,000 plants.

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TURNIP, 1 ounce to 200 feet of drill; 1 to 2 pounds to an acre.

WATERMELON, 1 ounce to 30 hills.

THE END

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Wallace. Mr. Wallace has brought together in one volume all the valuable information on the different ways of making and carrying the different kinds of packs. The ground covered ranges from man-packing to horse-packing, from the use of the tump line to throwing the diamond hitch.

22. THE BULL TERRIER, by Williams Haynes.

This is a companion book to "The Airedale" and "Scottish and Irish Terriers" by the same author. Its greatest usefulness is as a guide to the dog owner who wishes to be his own kennel manager. A full account of the development of the breed is given with a description of best types and standards. Recommendations for the care of the dog in health or sickness are included. The chapter heads cover such matters as:—The Bull Terrier's History—Training the Bull Terrier—The Terrier in Health—Kenneling—Diseases.



23. THE FOX TERRIER, by Williams Haynes. As in his other books on the terrier, Mr. Haynes takes up the origin and history of the breed, its types and standards, and the more exclusive representatives down to the present time. Training the Fox Terrier—His Care and Kenneling in Sickness and Health—and the Various Uses to Which He Can Be Put—are among the phases handled.

24. SUBURBAN GARDENS, by Grace Tabor. Illustrated with diagrams. The author regards the house and grounds as a complete unit and shows how the best results may be obtained by carrying the reader in detail through the various phases of designing the garden, with the levels and contours necessary, laying out the walks and paths, planning and placing the arbors, summer houses, seats, etc., and selecting and placing trees, shrubs, vines and flowers. Ideal plans for plots of various sizes are appended, as well as suggestions for correcting mistakes that have been made through "starting wrong."



25. FISHING WITH FLOATING FLIES, by Samuel G. Camp. This is an art that is comparatively new in this country although English anglers have used the dry fly for generations. Mr. Camp has given the matter special study and is one of the few American anglers who really understands the matter from the selection of the outfit to the landing of the fish. His book takes up the process in that order, namely—How to Outfit for Dry Fly Fishing—How, Where, and When to Cast—The Selection and Use of Floating Flies—Dry Fly Fishing for Brook, Brown and Rainbow Trout—Hooking, Playing and Landing—Practical Hints on Dry Fly Fishing.

26. THE GASOLINE MOTOR, by Harold Whiting Slauson. Deals with the practical problems of motor operation. The standpoint is that of the man who wishes to know how and why gasoline generates power and something about the various types. Describes in detail the different parts of motors and the faults to which they are liable. Also gives full directions as to repair and upkeep. Various chapters deal with Types of Motors—Valves—Bearings—Ignition—Carburetors—Lubrication—Fuel—Two Cycle Motors.

27. **ICE BOATING**, by H. L. Stone. Illustrated with diagrams. Here have been brought together all the available information on the organization and history of ice-boating, the building of the various types of ice yachts, from the small 15 footer to the 600-foot racer, together with detailed plans and specifications. Full information is also given to meet the needs of those who wish to be able to build and sail their own boats but are handicapped by the lack of proper knowledge as to just the points described in this volume.

28. **MODERN GOLF**, by Harold H. Hilton. Mr. Hilton is the only man who has ever held the amateur championship of Great Britain and the United States in the same year. In addition to this, he has, for years, been recognized as one of the most intelligent, steady players of the game in England. This book is a product of his advanced thought and experience and gives the reader sound advice, not so much on the mere swinging of the clubs as in the actual playing of the game, with all the factors that enter into it. He discusses the use of wooden clubs, the choice of clubs, the art of approaching, tournament play as a distinct thing in itself, and kindred subjects.

29. **INTENSIVE FARMING**, by L. C. Corbett. A discussion of the meaning, method and value of intensive methods in agriculture. This book is designed for the convenience of practical farmers who find themselves under the necessity of making a living out of high-priced land.

30. **PRACTICAL DOG BREEDING**, by Williams Haynes. This is a companion volume to **PRACTICAL DOG KEEPING**, described below. It goes at length into the fundamental questions of breeding, such as selection of types on both sides, the perpetuation of desirable, and the elimination of undesirable, qualities, the value of prepotency in building up a desired breed, etc. The arguments are illustrated with instances of what has been accomplished, both good and bad, in the case of well-known breeds.

31. **PRACTICAL DOG KEEPING**, by Williams Haynes. Mr. Haynes is well known to the readers of the **OUTING HANDBOOKS** as the author of books on the terriers. His new book is somewhat more ambitious in that it carries him into the general field of selection of breeds, the buying and selling of dogs, the care of dogs in kennels, handling in bench shows and field trials, and at considerable length into such subjects as food and feeding, exercise and grooming, disease, etc.



32. THE VEGETABLE GARDEN, by R. L. Watts.

This book is designed for the small grower with a limited plot of ground. The reader is told what types of vegetables to select, the manner of planting and cultivation, and the returns that may be expected.

33. AMATEUR RODMAKING, by Perry D. Frazer.

Illustrated. A practical manual for all those who want to make their own rod and fittings. It contains a review of fishing rod history, a discussion of materials, a list of the tools needed, description of the method to be followed in making all kinds of rods, including fly-casting, bait-fishing, salmon, etc., with full instructions for winding, varnishing, etc.

34. PISTOL AND REVOLVER SHOOTING, by A. L.

A. Himmelwright. A new and revised edition of a work that has already achieved prominence as an accepted authority on the use of the hand gun. Full instructions are given in the use of both revolver and target pistol, including shooting position, grip, position of arm, etc. The book is thoroughly illustrated with diagrams and photographs and includes the rules of the United States Revolver Association and a list of the records made both here and abroad.

35. PIGEON RAISING, by Alice MacLeod.

This is a book for both fancier and market breeder. Full descriptions are given of the construction of houses, the care of the birds, preparation for market, and shipment. Descriptions of the various breeds with their markings and characteristics are given. **Illustrated** with photographs and diagrams.

36. FISHING TACKLE, by Perry D. Frazer. II-

Illustrated. The subtitle is descriptive. "Hints for Beginners in the Selection, Care, and Use of Rods, Reels, Lines, etc." It tells all the fisherman needs to know about making and overhauling his tackle during the closed season and gives full instructions for tournament casting and fly-casting. Chapters are included on cases and holders for the care of tackle when not in use.

37. AUTOMOBILE OPERATION, by A. L. Brennan, Jr. Illustrated. Tells the plain truth about the little things that every motorist wants to know about his own car. Do you want to cure ignition troubles? Overhaul and adjust your carbureter? Keep your transmission in order? Get the maximum wear out of your tires? Do any other of the hundred and one things that are necessary for the greatest use and enjoyment of your car? Then you will find this book useful.

38. THE FOX HOUND, by Roger D. Williams. Author of "Horse and Hound". Illustrated. The author is the foremost authority on fox hunting and foxhounds in America. For years he has kept the foxhound studbook, and is the final source of information on all disputed points relating to this breed. His book discusses types, methods of training, kenneling, diseases and all the other practical points relating to the use and care of the hound. An appendix is added containing the rules and regulations of hound field trials.

39. SALT WATER GAME FISHING, by Charles F. Holder. Mr. Holder covers the whole field of his subject devoting a chapter each to such fish as the tuna, the tarpon, amberjack, the sail fish, the yellow-tail, the king fish, the barracuda, the sea bass and the small game fishes of Florida, Porto Rico, the Pacific Coast, Hawaii, and the Philippines. The habits and habitats of the fish are described, together with the methods and tackle for taking them. The book concludes with an account of the development and rules of the American Sea Angling Clubs. Illustrated.

40. WINTER CAMPING, by Warwick S. Carpenter. A book that meets the increasing interest in outdoor life in the cold weather. Mr. Carpenter discusses such subjects as shelter equipment, clothing, food, snowshoeing, skiing, and winter hunting, wild life in winter woods, care of frost bite, etc. It is based on much actual experience in winter camping and is fully illustrated with working photographs.

41. WOODCRAFT FOR WOMEN, by Mrs. Kathrene Gedney Pinkerton. The author has spent several years in the Canadian woods and is thoroughly familiar with the subject from both the masculine and feminine point of view. She gives sound tips on clothing, camping outfit, food supplies, and methods, by which the woman may adjust herself to the outdoor environment.

42. SMALL BOAT BUILDING, by H. W. Patterson. Illustrated with diagrams and plans. A working manual for the man who wants to be his own designer and builder. Detail descriptions and drawings are given showing the various stages in the building, and chapters are included on proper materials and details.

43. ***READING THE WEATHER**, by T. Morris Longstreth. The author gives in detail the various recognized signs for different kinds of weather based primarily on the material worked out by the Government Weather Bureau, gives rules by which the character and duration of storms may be estimated, and gives instructions for sensible use of the barometer. He also gives useful information as to various weather averages for different parts of the country, at different times of the year, and furnishes sound advice for the camper, sportsman, and others who wish to know what they may expect in the weather line.

44. **BOXING**, by D. C. Hutchison. Practical instruction for men who wish to learn the first steps in the manly art. Mr. Hutchison writes from long personal experience as an amateur boxer and as a trainer of other amateurs. His instructions are accompanied with full diagrams showing the approved blows and guards. He also gives full directions for training for condition without danger of going stale from overtraining. It is essentially a book for the amateur who boxes for sport and exercise.

45. **TENNIS TACTICS**, by Raymond D. Little. Out of his store of experience as a successful tennis player, Mr. Little has written this practical guide for those who wish to know how real tennis is played. He tells the reader when and how to take the net, discusses the relative merits of the back-court and volleying game and how their proper balance may be achieved; analyzes and appraises the twist service, shows the fundamental necessities of successful doubles play.

46. ***HOW TO PLAY TENNIS**, by James Burns. This book gives simple, direct instruction from the professional standpoint on the fundamentals of the game. It tells the reader how to hold his racket, how to swing it for the various strokes, how to stand and how to cover the court. These points are illustrated with photographs and diagrams. The author also illustrates the course of the ball in the progress of play and points out the positions of greatest safety and greatest danger.

47. **TAXIDERMY**, by Leon L. Pray. Illustrated with diagrams. Being a practical taxidermist, the author at once goes into the question of selection of tools and materials for the various stages of skinning, stuffing and mounting. The subjects whose handling is described are, for the most part, the every-day ones, such as ordinary birds, small mammals, etc., although adequate instructions are included for mounting big game specimens, as well as the preliminary care of skins in hot climates. Full diagrams accompany the text.

48. THE CANOE—ITS SELECTION, CARE AND USE, by Robert E. Pinkerton. Illustrated with photographs. With proper use the canoe is one of the safest crafts that floats. Mr. Pinkerton tells how that state of safety may be obtained. He gives full instructions for the selection of the right canoe for each particular purpose or set of conditions. Then he tells how it should be used in order to secure the maximum of safety, comfort and usefulness. His own lesson was learned among the Indians of Canada, where paddling is a high art, and the use of the canoe almost as much a matter of course as the wearing of moccasins.

49. HORSE PACKING, by Charles J. Post. Illustrated with diagrams. This is a complete description of the hitches, knots, and apparatus used in making and carrying loads of various kinds on horseback. Its basis is the methods followed in the West and in the American Army. The diagrams are full and detailed, giving the various hitches and knots at each of the important stages so that even the novice can follow and use them. It is the only book ever published on this subject of which this could be said. Full description is given of the ideal pack animal, as well as a catalogue of the diseases and injuries to which such animals are subject.

51. *LEARNING TO SKATE, by J. F. Verne. The general problem of the art of skating is taken up from the standpoint of the man or woman who puts on skates for the first time. Fundamental rules are laid down for learning the simpler strokes, carrying the reader on through to speed and fancy skating. Advice is included on the proper skates and clothing.

52. *TOURING AFOOT, by Dr. C. P. Fordyce. Illustrated. This book is designed to meet the growing interest in walking trips and covers the whole field of outfit and method for trips of varying length. Various standard camping devices are described and outfits are prescribed for all conditions. It is based on the assumption that the reader will want to carry on his own back everything that he requires for the trip.

53. *THE MARINE MOTOR, by Lieut. Frank W. Sterling, U. S. N. Illustrated with diagrams. This book is the product of a wide experience on the engineering staff of the United States Navy. It gives careful descriptions of the various parts of the marine motor, their relation to the whole and their method of operation; it also describes the commoner troubles and suggests remedies. The principal types of engines are described in detail with diagrams. The object is primarily to give the novice a good working knowledge of his engine, its operation and care.

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